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No. 830

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ELECTRIC POWER AND POWER EQUIPMENT

UDC 621.311.001.13.002.237

TEPLOELEKTROPROYEKT SOLUTION TO DESIGN OF THERMAL AND NUCLEAR POWER PLANTS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 7, Jul 78 pp 2-11

[Article by Director of the All-Union State Order of Lenin and Order of the October Revolution Planning Institute Teploelektroproyekt I. A. Alekseyev]

[Text] The social-political, domestic and economic life of our country and the entire multifaceted activity of the Soviet people and their vanguard Leninist party are being developed under the benevolent effect of the historical decisions of the 25th CPSU Congress. Last year -- the 60th Anniversary of the Soviet state and adoption of the new Constitution of the USSR -- was marked by new advances on the path of the socioeconomic development of our country.

The December (1977) Plenary Session of the CPSU Central Committee and the Eighth Session of the Supreme Soviet of the USSR summarized the results of the first 2 years of the 10th Five-Year Plan and discussed and adopted the State Plan for economic and social development of the USSR and the State Budget for 1978. Extensive and debated conclusions and positions on measures to solve the most important national economic problems for the forthcoming period, advanced in the speech of General Secretary of the CPSU Central Committee, Chairman of the Presidium of the Supreme Soviet of the USSR Comrade L. I. Brezhnev at the Plenary Session, laid the basis for solution of it.

The collective of the Teploelektroproyekt Institute, like all the Soviet people, successfully completed the first 2 years of the five-year plan with efficiency and quality. The 1976 and 1977 plans of design-research work were completed ahead of schedule by the institute, on 28 December.

The extensively organized socialist competition permitted the collective to achieve an increase of labor productivity by 3 percent in 1976 and by 2.2 percent in 1977. The institute as a whole and all its 12 departments coped successfully with all the tasks of the state plan in design-research work and socialist pledges for the 2 years. A total of 157 contract designs, 298 contract-detail designs, 69 scientific research papers and so on were completed during 1976-1977.

During 2 years of the five-year plan, the institute completed a number of investigations of important national economic significance, including contract designs for the Berezovskaya GRES-1 with output of 6.4 million kW (Figures 1 and 2), the Permskaya GRES with output of 4.8 million kW and the Chigirinskaya GRES with output of 3.2 million kW with 800 MW blocks, the Ekibastuzskaya GRES-2 with output of 4 million kW having 800 MW blocks, the Krymskaya AES with output of 2 million kW and the West Ukrainian AES with output of 4 million kW using VVER-1000 reactors, the Angrenskaya GRES with output of 2.4 million kW and so on; technical-economic justification of the Talimardzhanskaya GRES with output of 2.2 million kW having 800 MW blocks, the Southern Kazakhstan GRES with output of 4 million kW having 500 MW blocks, heat supply layouts and contract designs for thermal systems for more than 20 cities and so on.

Approximately 11.7 million kW of new power capacities (including the 500 MW energy block at the Reftinskaya GRES and the latest 800 MW energy blocks at the Zaporozhskaya and Uglegorskaya GRES, were put into operation during 2 years at domestic power plants from plans of the institute. Moreover, more than 2.8 million kW fo new power capacities were introduced at foreign power plants during 1976-1977 from plans of the institute. Extensive work is being carried out on scientific-technical operation with CEMA member countries and also with capitalist countries such as England, the United States and Canada.

As in previous years, all the work of the collective and of its party, Konsomol and trade-union organizations was directed in 1977 to provide further development of the thermal and atomic power engineering of the country on the basis of scientific and technical progress and to improve the efficiency of the branch by better, progressive technical solutions of the planned thermal and atomic power plants.

The collective of the institute was the innovator of a complex approach to solution of the problems of the Ninth Five-Year Plan. In 1971 Teploelektroproyekt was the first among the planning institutes to develop a complex plan of measures to implement the decisions of the 24th CPSU Congress, which was successfully concluded.

The accumulated experience permitted development with the extensive active participation of all research associates of a complex plan of measures of Teploelektroproyekt Institute on implementation of the decisions of the 25th CPSU Congress.

After ratification by an open party meeting of the institute in June 1976, this plan became the operating program for the entire collective, determining the main trends in the activity of the institute on solution of the main problems of thermal and atomic power engineering for 1976-1980. The main ones of these problems are:

further concentration of the power engineering capacities by planning and construction of GRES with output of 6.4 and 4.0 million kW having 800 and

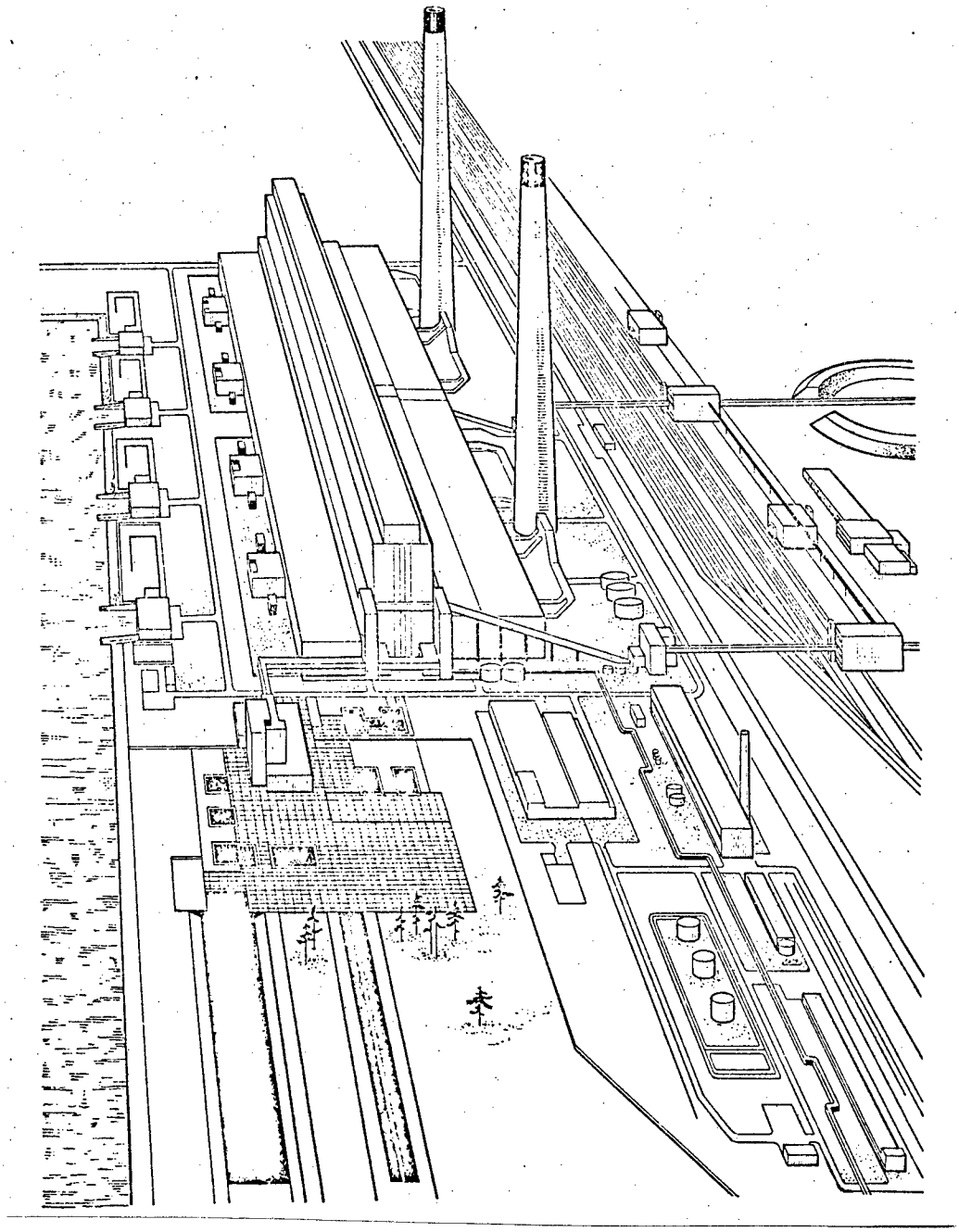


Figure 1. Berezovskaya GRES-1. View of industrial site

500 MW blocks, TETs with turbines having unit output of 135, 175 and 250 MW and AES with VVER-1000 reactors;

extensive use of inexpensive solid fuel in the eastern regions (Kansk-Achinsk and Ekibastuz coal) and nuclear fuel in the European part of the country for electric power production;

continuation of work on new methods of producing electric power and new types of power plants;

complex solution of the problems of designing electric power plants both from the viewpoint of the institute's participation in development of large complex programs for the long-term (development of territorial-industrial complexes: the West Siberian, Pavlodar-Ekibastuz, Southern Yakutsk and so on) and from the viewpoint of more complete utilization of electric power plant wastes in the national economy (utilization of waste heat for fish breeding and vegetable growing, ash-slag wastes for construction and so on);

implementation of measures on environmental protection;

improvement of planning solutions of traditional electric power plants, including those due to introduction of new effective materials and structural members in designs and review of already ratified, but not yet implemented plans from these positions.

The dynamics of strengthening the unit capacities of energy blocks, presented in Table 1, reflects one of the characteristics of the 10th Five-Year Plan -- a more than fourfold increase of the 500 MW or more blocks in the total output of energy blocks introduced during the 10th Five-Year Plan compared to their fraction in the total output of blocks introduced during the Ninth Five-Year Plan.

Fulfilling the tasks of the 10th Five-Year Plan provided preliminary input of energy blocks for supercritical pressure (s.k.d.), whose output exceeded 30 percent of the total output of the TES of Minenergo [Ministry of Power and Electrification] of the USSR by the end of 1977, at thermal power plants (TES). It should be noted that the highest fraction of s.k.d. blocks abroad is at the TES of Japan and it comprised 23.8 percent in 1975; it was a total of 15.4 percent in the United States in 1974, while only 21 percent of the capacities of s.k.d. blocks is provided in the plans for input of capacities for 1978-1981.

TABLE 1

Unit output of energy blocks, MW	1971-1975: Number of introduced energy blocks	1971-1975: Their total output, MW	1976-1980: Number of energy blocks to be introduced	1976-1980: Their total output, MW
1200	--	--	1	1200
800	3	2400	7	5600
500	1	500	10	5000
300	63	18900	14	4200
210	35	7350	32	6720
160	5	800	1	160
Total	107	29950	65	22880

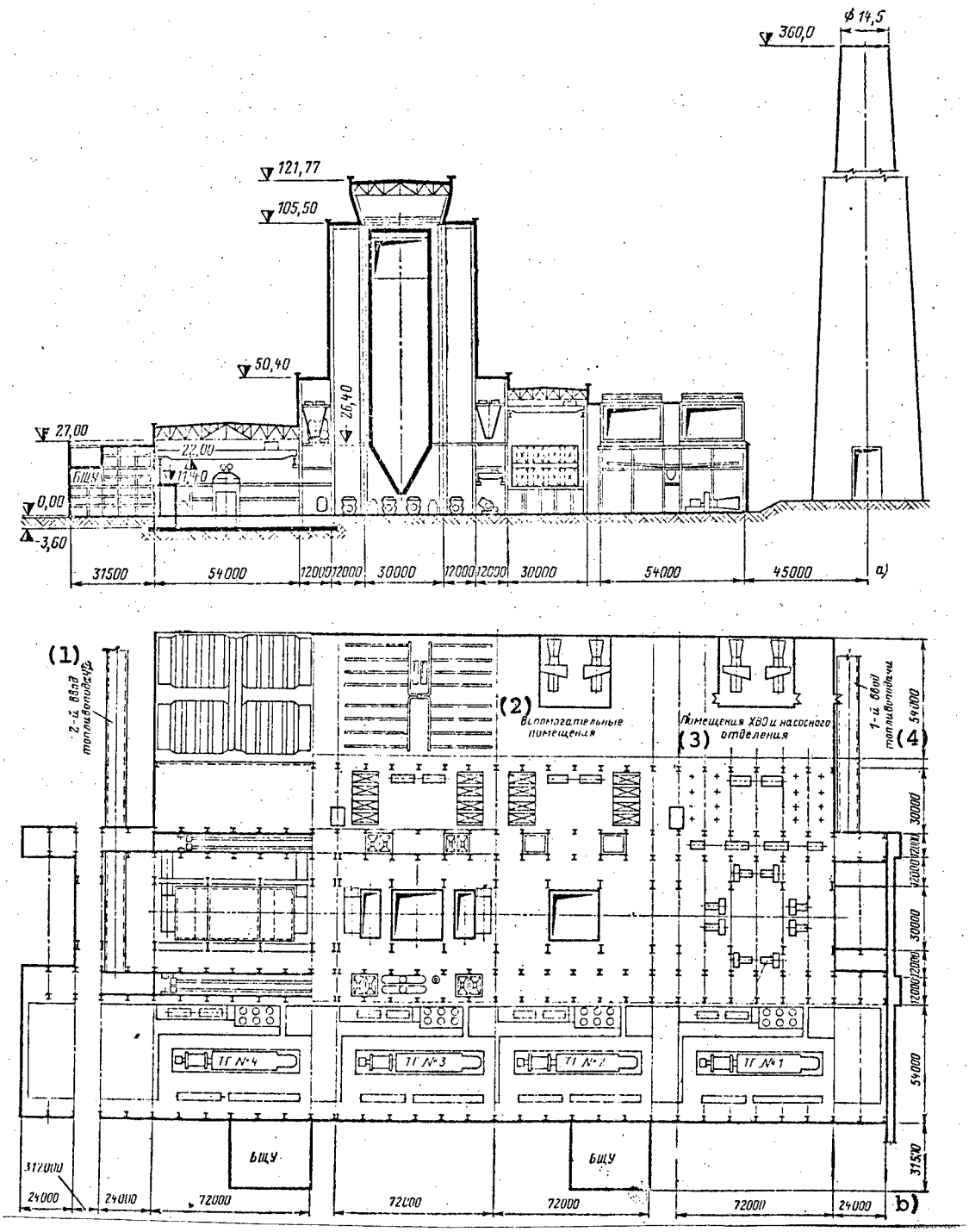


Figure 2. Cross-Section (a) and Layout (b) of the Main Building of the Berezovskaya GRES-1

KEY:

1. Second fuel feel input
2. Auxiliary rooms
3. KhVO and pumping section rooms
4. First fuel feed input

The planned concentration of energy capacities for the 10th Five-Year Plan will also be expressed by the growth of the established output of introduced power plants and accordingly of the number of powerful TES and AES. Whereas there were only 19 TES and 1 AES with an output of 2 million kW or more each by the end of 1975 in the country, including the Krivorozhskaya GRES-2 with output of 2 million kW and the Leningrad AES with output of 2 million MW, another 7 GRES, including the Reftinskaya with output of 2.8 million kW, will be added to them during the 10th Five-Year Plan. Moreover, the output of the number of TES and AES, which comprised 2 million kW even in 1975, including the Uglegorskaya and Zaporozhskaya GRES, which reached design capacity of 3.6 million kW in 1977 and became the world's largest TES, will increase.

Construction of GRES and AES with design capacity of 4 million kW or more is planned during the 10th Five-Year Plan. Deadlines for introduction of the power plants of the Ekibastuz Fuel-Energy Complex have been established and specifically, the first four blocks of 500 MW each at the Ekibazstuskaya GRES-1 already under construction with design capacity of 4 million kW (Figures 3 and 4) should be introduced by the end of 1980. Construction of the first electric power plant of the Kansk-Achinsk Fuel-Energy Complex -- the Berezovskaya GRES-1 with design capacity of 6.4 million kW and the Kalininskaya and Southern Ukrainian AES with VVER-1000 reactors having design capacity of 4 million kW each -- was begun.

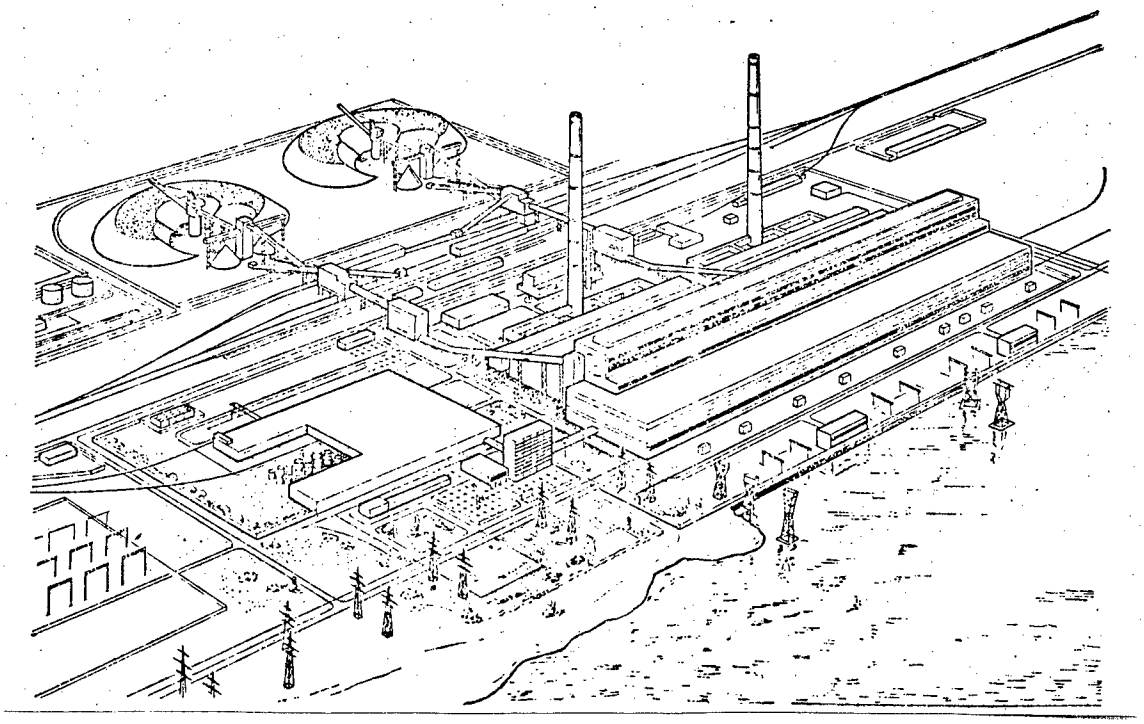


Figure 3. Ekibastuzskaya GRES-1. View of the industrial site

The tasks of the 25th CPSU Congress for the 10th Five-Year Plan on development of power engineering also determined one of the main problems which the Teploelektroproyekt Institute will solve during 1976-1980 -- development of plans for a new generation of serial electric power plants: GRES with design capacity of 4 million kW having 500 MW blocks, operating on Ekibastuz coal, a GRES with design capacity of 6.4 million kW with 800 MW coal-dust blocks, AES with design capacity of 4 million kW or more with VVER-1000 reactors and so on. It is planned to increase the thermal economy of these power plants compared to the best power plants introduced up to 1976 (Table 2), which corresponds to the tasks posed by the 25th CPSU Congress to the power engineering branch on reducing the specific consumption of comparison fuel and saving natural fuel at thermal power plants.

It is also planned to improve the other technical-economic indicators of TES and AES compared to those of the TES and AES introduced during the Ninth Five-Year Plan (Table 3).

The entire experience of planning and construction of block TES in the USSR and abroad is being taken into account by the institute in developing the design of the GRES with output of 4.0 and 6.4 million kW. Specifically, together with increasing the unit output of the energy blocks, consolidated main and auxiliary equipment is being developed for them: single-building boiler unit with steam productivity of 2,650 t/hr operating on solid fuel; enlarged RVP, deaerators and electric filters; new grinding equipment (medium-speed mills and grinding blowers); continuously operating machines with productivity up to 2,000 t/hr for coal warehouses; regenerative mixed type heaters and so on.

Equipment which has proven itself on 500 MW blocks of the Troitskaya GRES and on 800 MW blocks of the Zaprorzhskaya and Uglegorskaya GRES, is also being used in designs of GRES rated at 4.0 and 6.4 million kW. At the same time work is being continued on development of small boilers operating on solid fuel for 500 and 800 MW energy blocks.

The characteristic feature of the 10th Five-Year Plan is significant development of atomic power engineering compared to previous years. No fewer than 20 percent of the energy capacities introduced in 1976-1980 should be comprised of AES energy blocks. In 1976 and 1977 investigations on the atomic topic comprised more than 20 percent of the total annual volume of design-research work of the institute. The institute is continuing to design AES with VVER-440 reactors and is also participating in design of AES with RBMK-1000 reactors, including the Leningrad and Ignalinskaya AES. But the main trend for the institute during the 10th Five-Year Plan has become development of the unified design of AES with VVER-1000 reactors. Moreover, investigations are being conducted on development of a pilot energy block of 600 MW with a fast neutron reactor for the third block of a Beloyarskaya AES.

In 1976-1980 the institute will continue the important work on development of combined production of electric and thermal energy. Contract designs

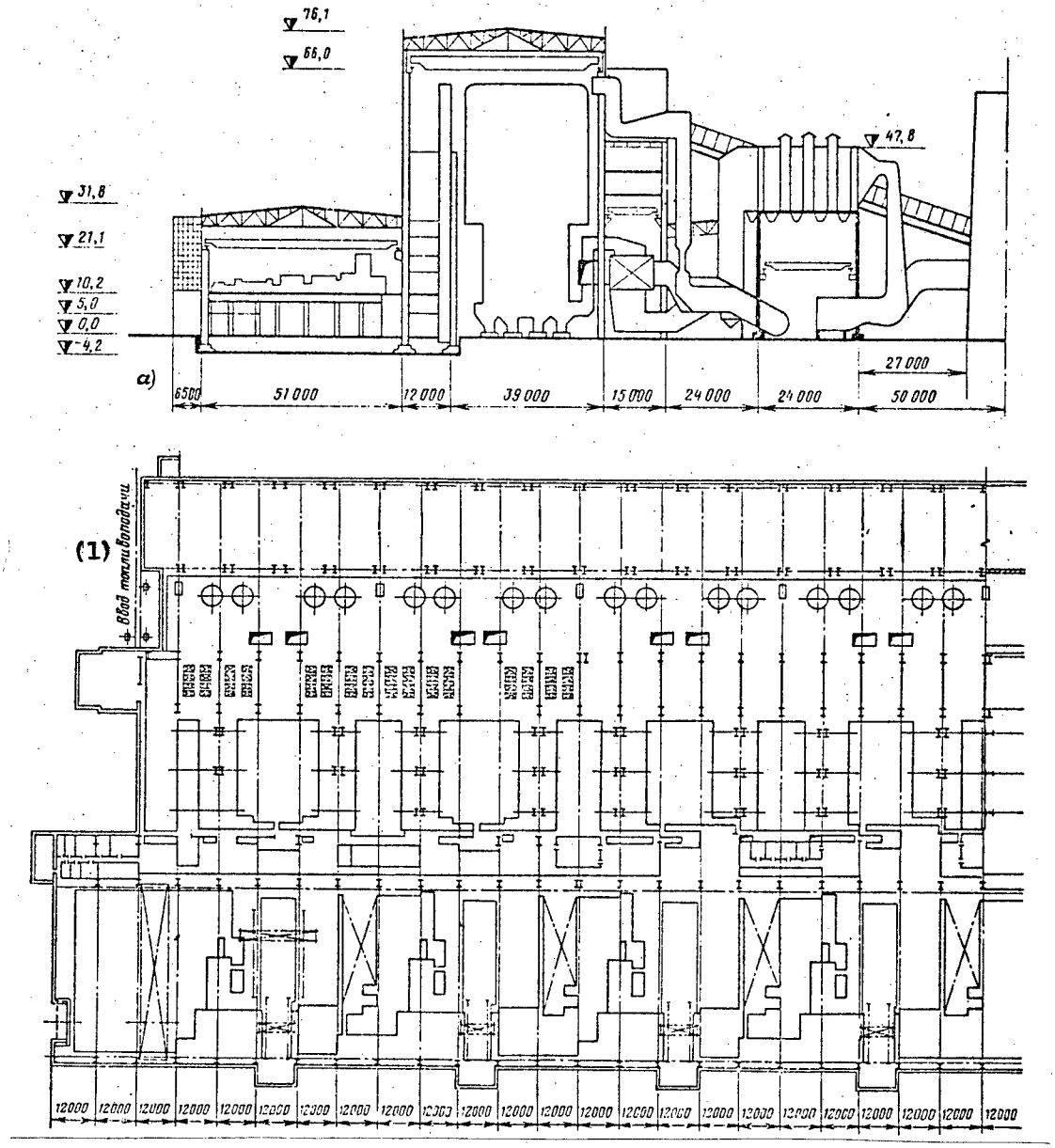


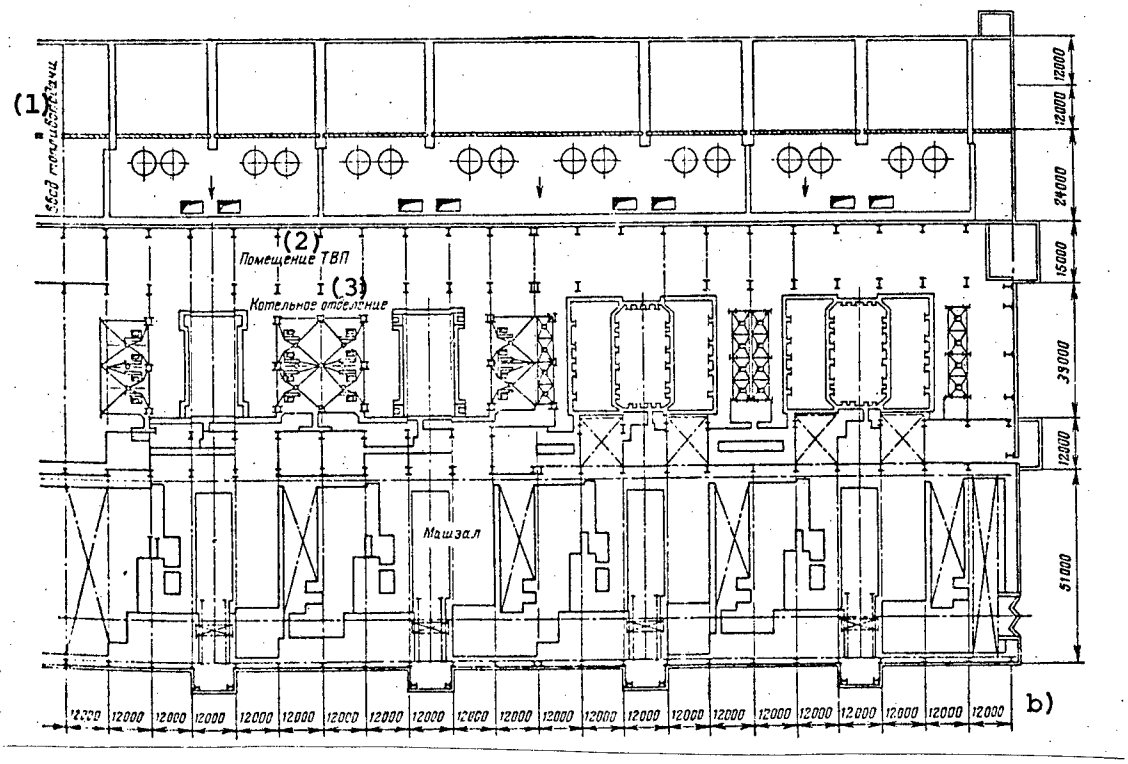
Figure 4. Cross-Section (a) and Layout (b) of the Main Building of the Ekibastuzskaya GRES-1

KEY:

1. Fuel feed input
2. TVP room
3. boiler room
4. machine room

(Figure 4 continued on following page)

of the Kirovskaya TETs-5, the Kievskaya TETs-6, the Nizhnekamskaya TETs-2, the Novo-Astrakhanskaya TETs and so on have been developed during the first



(Figure 4 continued)

2 years of the five-year plan. The Neryungrinskaya TETs-GRES for supplying energy to the construction regions of BAM [Baykal-Amur Mainline Railroad] and the Southern Yakutsk Territorial-Industrial Complex are being constructed from a design of the institute.

Heat supply schemes for the cities of Novosibirsk, Chita, Vladivostok, Cheboksary and Novocheboksarsk, Riga, Kostroma, Neryungri and so on have been developed. Investigations are being conducted on centralized heating from atomic heating (boiler) plants and atomic TETs (AST and ATETs) which will be the heat supply basis in the near future. This will permit saving hundreds of millions of tons of mazut and billions of cubic meters of gas.

The basis of a district heating system during the 10th Five-Year Plan will as before be steam-turbine TETs, into the designs of which will be and are being introduced the following trends:

an increase of the established output of TETs and of the unit capacities of district heating units;

improvement of the structure of the existing TETs equipment to increase electric power production based on heat consumption and replacement of worn-out and morally obsolescent equipment;

simplification of the process flow diagrams and extensive introduction of standardized engineering solutions for TETs into the designs.

Development of the designs of powerful TETs with PT-135/165-130, T-175/210-130, T-180/215-130, T-250/300-240, R-100-130 and TR-100-130 turbines is being completed.

Along with development of the designs of traditional TES and AES, the institute is continuing to develop new power plants and new methods of producing electric power, specifically:

a series of modernized GTU with output of 100 MW is already being introduced at GRES No. 3 of Mosenergo;

a working design of steam power semipeak blocks of 500 MW with a K-500-130 turbine is being developed; it should be emphasized that the designs of GRES with GT-100 and K-500-130 turbines create good prerequisites for solving the problem of covering peak and semipeak loads;

the contract design of a PGU with output of 250 MW with low-pressure steam generator of type TGM-104 has been developed;

investigations are being conducted to develop a PGU with output of 670 MW with low-pressure steam generator (with gas discharge into a boiler) operating on solid fuel and a magnetohydrodynamic (MHD) installation in combination with installations operating on steam, gas turbine or steam-gas cycles and so on; according to approximate analysis, this combination may provide an increase of the thermal efficiency of the entire installation up to 60 percent. It is planned to develop a design of a pilot combined MHD energy block with output of 500 MW during the 10th Five-Year Plan.

The principal regulation of the 25th CPSU Congress on development of large complex programs for the long-term is the basis of the complex plan of the institute. An example of a creative complex approach of the collective to solution of problems of thermal power engineering development is the institute's development of the power section of the technical-economic justification for construction of the Kansk-Achinsk Fuel-Energy Complex (KATEK). In 1977 this work was considered by the NTS [Scientific and Technical Council] of Minenergo of the USSR and was recommended for ratification with excellent quality.

The characteristic feature of the new approach in development of KATEK was expressed primarily in centralization of production on the basis of extensive, including interbranch, cooperation in construction, operation and repair of power plants, town and road management and so on. Specifically, to organize a power plant repair service, the institute jointly with the customer and Giproenergoremont Institute [expansion unknown] refused to construct central repair shops at each GRES and provided a centralized energy repair base, the main section of which is the repair plant.

This solution permits a significant increase of labor productivity in repair, improvement of the quality of repair work and a reduction of the number of repairmen, while organization of an exchange stock of spare parts, subassemblies and equipment parts in the energy repair association will

Table 2

(1) Показатель	(2) ГРЭС, введенные до 1976 г.							(12) ГРЭС, вводимые и проектируемые в 1976—1980 гг.						
	(3) газомазутные			(4) пылеугольные				(3) газомазутные			(4) пылеугольные			
	(5) Костромская (8×300 МВт)	(6) Кармановская (6×300 МВт)	(7) Сургутская (12×210 МВт)	(8) Рефтинская (6×300 МВт)	(9) Ермаковская (6×300 МВт)	(10) Троицкая (3×300 МВт)	(11) Беловская (6×200 МВт)	(13) Костромская (III очередь 1×1200 МВт)	(14) Углегорская (3×300 МВт)	(15) Запорожская (3×300 МВт)	(16) Березовская-1 (8×800 МВт)	(17) Пермская (6×800 МВт)	(18) Троицкая (2×500 МВт)	(19) Экибастузская (6×500 МВт)
(20) Проектный удельный расход топлива, г/(кВт·ч)	327	330,5	337	330	332	337	344	313	322,1	322	323	331	334	336
Фактический удельный расход топлива, г/(кВт·ч): (21)														
1975 г.	324,6	325,2	330,3	375,4	338	353,3	347	—	—	—	—	—	351,9	—
1976 г.	322,5	322,8	337,8	335,5	336,8	348,9	347	—	334,1	340,1	—	—	342,5	—
1977 г.	321,2	321,5	337,5	333,6	335,7	348,4	336,0	—	328,2	328,7	—	—	339,3	—

KEY:

1. Indicator
2. GRES introduced prior to 1976
3. gas-mazut
4. crushed coal
5. Kostromskaya
6. Karmanovskaya
7. Surgutskaya
8. Reftinskaya
9. Yermakovskaya
10. Troitskaya
11. Belovskaya
12. GRES introduced and planned in 1976-1980
13. Kostromskaya (third unit, 1 x x 1,200 MW)
14. Uglegorskaya
15. Zaporozhskaya
16. Berezovskaya-1
17. Permskaya
18. Troitskaya
19. Ekibastuzskaya
20. Specific designed fuel consumption, g/(kW·hr)
21. Actual specific fuel consumption, g/(kW·hr)

provide smooth operation of the plant throughout the entire year on industrial-plant repair of all transportable equipment.

Thus, conditions are being created at sites of GRES for unit repair of power plant energy equipment. Interbranch (with Minugleprom [Ministry of the Coal Industry]) cooperation on energy equipment repair and foundry production is provided with planning of an energy repair base. These new planning solutions have gained the support of Gosplan and Gosstroy of the USSR.

The organization of construction-installation work has also been solved in a completely new manner in this complex. A unified regional production-supply base (RPKB) which will provide continuous industrial construction of all GRES with annual introduction of not less than 2-3 blocks of 800 MW each, has been created to construct all GRES of the southern industrial junction.

The problems of using all structures created during construction of power engineering objects and the wastes of energy production in the national economy were solved in a complex manner in planning of KATEK, which will give life to the new territorial-industrial complex. Specifically, efficient utilization of waste heat is provided: in energy-management complexes with unified technique of electric power production and agricultural products (vegetable growing, flower growing, greenhouse management, soil heating

TABLE 3

1) Показатель	2) Девятая пятилетка							3) Десятая пятилетка						
	4) АЭС		5) ТЭС					АЭС	ТЭС					
			8) газомазутные			9) угольные		15)	газомазутные			угольные		
	6) Кольская	7) Армянская	Сырдарьинская ГРЭС (I очередь) 10)	Ирклинская ГРЭС 11)	Сургутская ГРЭС (I очередь) 12)	Тяжинская ГРЭС 13)	Ладыжинская ГРЭС 14)	Южно-Украинская (I очередь)	Костромская ГРЭС (III очередь) 16)	Запорожская ГРЭС 17)	Ставропольская ГРЭС 18)	Экибастузская ГРЭС-1 19)	Зуевская ГРЭС-2 20)	Гусиноозерская ГРЭС (I очередь) 21)
22) Основное оборудование:														
23) турбоагрегаты, МВт	8×220	4×220	4×300	6×300	2×12, 12×210	6×300	6×300	2×1000	2×1200 / 1×1200	4×300, 3×800	8×300	8×500	8×300	6×200
24) котлы (реакторы), т/ч (МВт)	4×440*	2×440*	4×950	6×950	2×75, 12×640	6×950	6×950	2×1000*	2×3950 / 1×3950	4×1000, 3×2650	8×1000	8×1630	8×1000	6×640
25) Топливо	Ядерное	Ядерное	Газ 26)	Газ, мазут 27)	Газ 28)	Уголь**, мазут** 29)	Уголь 30)	Ядерное	Мазут 31)	Уголь, мазут	Газ, мазут	Уголь	Уголь	Бурый уголь 32)
33) Главный корпус:														
34) удельная площадь, м²/МВт	23,5	40,6	19,6	18,3	25,6	19,2	19,0	16,15	11,0 / 11,1	14,65	18,2	15,4	19	27,4
35) удельный объем, м³/МВт	835	1042	690	672,4	905	846	903	614,9	513 / 567	630	635	802	890	1125
36) Удельная площадь отвода земель, га/МВт	0,465***	0,86	0,58	0,9	0,89	0,54	0,48	0,59	0,052 / 0,052	0,51	0,6	0,57	0,22	0,29
37) Удельная численность промышленно-производственного персонала, чел/МВт	0,766	0,737	0,75	0,67	0,613	1,05	1,095	0,55	0,36 / 0,688	0,5	0,625	0,401	0,76	0,79
38) Удельная стомость промстроительства, руб/кВт	236	252	113,0	110,4	174	132,8	132,1	193,5	120,0 / 245,4	116,22	108,5	120,13	135,3	122

* VVER reactors

** Three energy blocks

*** There is no reservoir, but the water of Lake Imandra is used

KEY:

1. Indicator
2. Ninth Five-Year Plan
3. 10th Five-Year Plan
4. AES
5. TES
6. Kol'skaya
7. Armyanskaya
8. gas-mazut
9. coal
10. Syrdar'ynskaya GRES (1st unit)
11. Iriklinskaya GRES
12. Surgutskaya GRES (1st unit)
13. Tripol'skaya GRES
14. Ladyzhinskaya GRES
15. Southern Ukrainian (1st unit)
16. Kostromskaya GRES (3rd unit)
17. Zaporozhskaya GRES
18. Stavropol'skaya GRES
19. Ekibastuzskaya GRES-1
20. Zuyevskaya GRES-2
21. Gusinoozerskaya GRES (1st unit)
22. Main equipment
23. turbounits, MW
24. boilers (reactors), t/hr (MW)
25. Fuel
26. Nuclear
27. Gas
28. Gas and mazut
29. Coal and mazut
30. Coal
31. Mazut
32. Lignite
33. Main building
34. specific area, m^2/MW
35. specific volume, m^3/MW
36. Specific area of land condemnation, ha/MW
37. Specific number of industrial-production personnel, men/MW
38. Specific construction cost, rubles/kW

and so on); in industrial fishery complexes of basin and pond type; for irrigation; for extending the navigation system in navigable canals; for organization of recreation zones, creation of sports buildings and so on.

The same principles as in planning of KATEK are being used in planning the construction of the Ekibastuz Fuel-Energy Complex.

The complex approach to construction of GRES was also determined in solution of such problems as development of highly mechanized ash and slag recovery plants for use in the construction industry; development of installations for reprocessing the wash water of RVP and the convective heating surfaces of boilers with using the recovery products in metallurgy and other branches of the national economy and so on.

The work of the institute on introduction of energy production recovery of Baltic shales and Kansk-Achinsk coal, which will permit improvement of the fuel balance of the country, will sharply reduce the volumes of transport of these fuels, will reduce harmful discharges into the atmosphere, improve the structure of planned TES and the working conditions of power plant personnel, increase the established output of power plants, will increase the efficiency of fuel utilization by directing the by-products of power production to those branches of the national economy where this will yield the greatest advantage (the petrochemical industry, agriculture and the construc tion materials industry) and so on, is acquiring special significance.

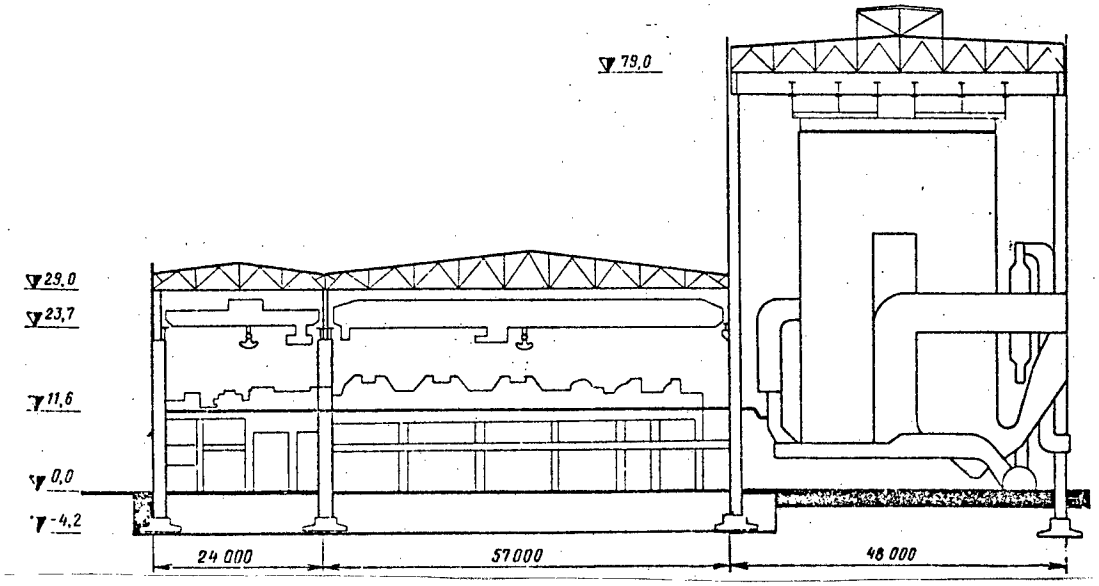


Figure 5. Cross-Section of Main Building of the Third Unit (1,200 MW Energy Block) of Kostromskaya GRES

A significant economic effect is expected from introduction of standard planning. Work is now being completed on standardization of GRES designs with 500 and 800 MW blocks, a standardized design of an AES with VVER-1000 reactors is being developed. It is assumed that introduction of standarized AES with VVER-1000 reactors will yield a 5-7 percent saving of capital expenditures compared to nonstandardized. A number of central heating and

power plants, specifically the Tallinskaya TETs-2, is being constructed by the standard design of a TETs of improved plant readiness. The main standard planning for TETs with small boilers may become the experimental Rostovskaya TETs-2.

The development of standard and standardized designs is being carried out on the basis of the most recent advances of domestic and foreign power engineering which provide the most modern planning solutions which permit more efficient use of capital investments and achievement of high operating indicators of power plants and a significant national economic effect.

In this case the collective is improving both individual elements and designs as a whole. One-building gas-tight boilers 0.7 percent more economical than non-gas-tight are provided in the designs for the KATEK GRES, Permskaya and Chigirinskaya GRES; the efficiency of the enlarged traction-blower machines will be provided at a level of 82-85 percent, while introduction of medium-speed grinders into the designs will permit a reduction of the specific electric power consumption by approximately 40 percent for grinding compared to the use of hammer mills. The specific fuel consumption will be reduced to 323 g/(kW·hr), while labor productivity in operation and repair will be increased by 25-30 percent.

The use of the interlocking principle of auxiliary buildings and structures and their standardization will permit a reduction of their number by approximately 40 percent and a decrease of the area of the industrial site of TES by 25-30 percent (the Tallinskaya TETs, the Ekibastuzskaya GRES-2, the Berezovskaya GRES-1 and so on).

The real tool for improving the design developments and for increasing the effectiveness of implementing them is continuously developed design and innovation work. The total economic effect from introduction of 84 inventions of workers of the institute in 1977 at 128 objects comprised approximately 27 million rubles.

One of the trends in the work of the institute, which permit an increase of the effectiveness of capital investments, is review of previously ratified but still not implemented designs. The result of this work in 1976-1977 was a reduction of the estimated cost of construction on 166 objects by 224.3 million rubles. Specifically, the design of the Ekibastuzskaya GRES-1, developed in 1967-1969, was reviewed, which permitted a reduction of the following needs at the power plant industrial site: 7,000 tons of metal, 1.05 million m^3 of excavation work, 530,000 man-days in labor expenditures for construction and so on.

As a result of implementing all the measures planned by the complex plan of the institute for 1976-1980, the following saving should be achieved: 88,700 tons of metal, 80,000 tons of cement and 8,250,000 man-days of labor expenditures for construction of TES and AES. The following saving of material and labor resources has already been achieved from introduction of

designs developed by the institute into energy construction according to the results of 1976-1977: 26,430 tons of metal, 19,838 tons of cement and 2,468,900 man-days of labor expenditures for construction.

It should be emphasized that the institute is solving all problems of planning thermal and atomic power plants with regard to the requirements of environmental protection. All designs produced by the institute now take into account the need and the material possibility of fulfilling these requirements. Design solutions which provide the following are used in this case:

location of power plants usually on marginal and unsuitable lands;

development of nondischarge power plants;

introduction of engineering solutions which prevent dusty ash heaps;

installation of electric filters with degree of ash removal up to 99.5 percent;

introduction of chimney stacks up to 400 m high with gas-scrubbing columns of very effective silicon-concrete designs and so on.

The institute is continuing investigations and design work on industrial scrubbing of flue gases of TES which burn high-sulfur fuel and of sulfur dioxides.

The problem of environmental protection is also being solved with utilization of the waste heat of TES and AES, since the negative ecological effect on the air basin, river systems and multiple use reservoirs is reduced significantly in this case.

Solution of major problems in development of scientific and technical progress in power engineering is impossible without clear organization of the management of design matters, improvement of planning technology and improving the quality of designs. The complex plan of the institute provides for special measures to improve organization, economics and improvement of planning technology. The basis of these measures are the following:

development of an automated control system for design production (ASUPP), which includes elements of controlling the planning and organization of the technical information of designers, automation of the design process and control of the issuance of design-estimate documentation on the basis of using modern computer and organizational technology, modern means of communications and economic-material methods of solving problems;

improvement of the organizational structure of all subdivisions of the institute and also of branches for further specialization, efficient organization of the work of all personnel of the institute and reduction of nonproductive labor expenditures;

improvement of work to improve the economy of design and to increase the labor productivity of designers;

improvement of research work.

It is planned to introduct the first unit of an automated TES design system (SAPR TES) into experimental operation in 1976-1980. Investigations are continuing on supplying the institute and its branches with computer technology and development of software for existing computers and those planned for installation.

The basis of work to improve the quality of designs is improvement of the normative-reference base and more extensive introduction of standard design of power plants as a whole and of individual subassemblies of designs. The institute has worked out a program of reviewing existing and development of new normative materials on design of TES and AES.

According to this program, a new editorial office for Norms for Technological Design of Thermal Power Plants has already been developed and newly developed Norms for Technological and Construction Design of Atomic Power Plants have been prepared. The institute has participated actively in the development of the Guideline Instructions on planning the organization and mechanization of repair work at atomic power plants, is participating in development of Norms for Designing Auxiliary Buildings of AES and so on. Existing regulations are being reviewed and new ones are being developed which encompass all stages of design, to subassemblies of detail drawings which frequently contain repeated graphic elements.

Implementation of measures to improve the economics of planning and organization of standardization and payment for labor and improvement of research work will permit an increase of labor productivity of designers and researchers by 9 percent during the 10th Five-Year Plan.

Giving proper due to what has been done and is being done at the institute to solve the main problems of the 10th Five-Year Plan, the collective of the institute at the same does not forget the unsolved problems and narrow points in its work and the entire activity of the institute is directed toward solution and correction of them.

Success in completing all tasks of the multifaceted activity of the institute depends primarily on people and on the contribution of each worker and the efforts of the entire collective. Therefore, the management, party, trade-union and Komsomol organizations are continuously working on improving educational work, directing it toward strengthening state and production discipline and toward increasing the feeling of responsibility, primarily among supervisory workers. The problem of educating cadres at the institute is regarded as the main one of all problems. The collective is laboring on solution of it, without sparing efforts or time. An important section of this work is organization of socialist competition between the sections of the institute and the subdivisions and individual workers on the basis of personal creative plans. The collective received with great enthusiasm and sincere gratitude awarding of the Order of Lenin Teploelektroproyekt

Institute the Order of the October Revolution for its important contribution to development of power engineering in the USSR. This high award and also awarding the institute the Lenin Jubilee Certificate and Jubilee Honorary Badge of the CPSU Central Committee on the results of the socialist competition during the Ninth Five-Year Plan inspired the workers of the institute to new labor achievements, for which the collective was repeatedly awarded the challenge Red Banners and Honorary Certificates of superior organizations during the 10th Five-Year Plan.

The youth of the institute is being educated in the traditions and on the example of our best veterans of labor such as I. Ye. Vorob'yev, L. Ya. Diman, V. S. Glukhov, V. N. Fadeyev, B. A. Neymark, A. F. Ivanitskiy and others.

L. I. Brezhnev said at the December (1977) Plenary Session of the CPSU Central Committee: "The labor impetus and rhythm of the jubilee competition must be retained and strengthened. Work better today than yesterday and work better tomorrow than today. This is the slogan of the day. And better means striving for quality, for efficiency and for an increase of labor productivity. This is the very core of socialist pledges as generally of all our economic activity."

Adopting the decisions of the December (1977) Plenary Session of the CPSU Central Committee as a long-term program of its activity in response to the Letter of the CPSU Central Committee, Council of Ministers of the USSR, VTsSPS [All-Union Central Trade Union Committee] and the Central Committee of VLKSM [All-Union Lenin Young Communist League] on organization of a socialist competition to fulfill and overfulfill the 1978 plan and to intensify the struggle to increase production efficiency and work quality, the collective of the institute is applying all efforts to successfully fulfill the tasks of 1978 and of the entire five-year plan as a whole.

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ELECTRIC POWER AND POWER EQUIPMENT

DEVELOPMENT OF SIBERIAN NATURAL RESOURCES DISCUSSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Sep 78 p 3

[Article by Yu. Chirkov, Doctor of Chemistry, Moscow -- Krasnoyarsk]

[Text] A general meeting of the Siberian Department of the USSR Academy of Sciences was held in February of this year in Novosibirsk. The new large-scale long-term superprogram "Complex Utilization of the Natural Resources of Siberia", of simply "Siberia", was discussed.

The 24th subprograms of the "Siberia" project dealt with rapid development of the wealth of the eastern half of our country and, particularly, of the Krasnoyarsk Kray.

KATEK

The Krasnoyarsk Kray has very rich deposits of coal. It includes the Taymyr, Tungus, Kansko-Achinsk, and Minusinsk basins. They represent all modifications and types of coal: there is graphite, brown coal, and fuels of all kinds and shades.

Everyone has heard of KATEK. It is Kansko-Achinsk fuel and power complex whose creation was envisaged in the resolutions of the 24th Party Congress.

The scale of the KATEK is tremendous. Its coal deposits (chiefly brown coal) stretch approximately 800 kilometers along the Siberian railroad.

The first KATEK section, Berezovskaya GRES-1, will be equal in its power to the design power of the Sayano-Shushensk ya GES.

Some people may ask whether or not it is necessary to push the construction of such gigantic power installations operating on coal. Is it not simpler, let us say, to construct hydroelectric power plants?

Calculations have shown that the rate of the development of Siberia is such that it is necessary every two years to put into operation such a power engineering giant as the Krasnoyarsk GES. And it will be necessary to do this every year during the next five-year plan! But it is clear that it is

impossible to put into operation a GES of the size of the Krasnoyarsk GES. The only way out is to burn Kansko-Achinsk coal as the most accessible and very profitable economically.

However, the presence of calcium in the ash of this coal makes it fusible, and the unavoidable admixture of sulfur cements the melt. The ash covers parts of the units, forming growth on the pipes of the furnace screens, shields, and other elements of boiler units.

The fusibility of the ash is the first and considerable difficulty. Evidently, a special design for the boiler is required. For the time being, the Kansko-Achinsk coal is used experimentally at the Krasnoyarsk TETs-2 and is tested on special stands. The situation is aggravated even more by the fact that the concentration of calcium in the ash varies from layer to layer and, therefore, the melting point of the ash and other characteristics also vary. But it is impossible to create a new design of boilers for every individual GRES.

Thus, some advantages change into disadvantages.

In addition to this not very inspiring situation, the Siberian rivers in the vicinity are inevitably affected by thermal pollution. So far, no one knows to what all this will lead.

The typical problem of Siberia is: the necessity of its own nonstandard and nontraditional solution of this problem. And there has appeared such a variant. It makes it possible to eliminate the undesirable aftereffects in burning the Kansko-Achinsk coal and, in addition to electric energy, to obtain chemical products.

Power Engineering Chemistry

Magnetohydrodynamic (MHD) generators promise a higher (up to 50-60 percent) efficiency of converting thermal energy to electric power.

The operating principle of MHD generators is very simple. During the burning of the fuel, the gas heated to approximately 3000 degrees in the combustion chamber forms plasma -- a substance consisting of positively and negatively changed particles. The movement of this plasma across the magnetic field leads to the generation of a direct electric current.

To date, a vast amount of material has been accumulated on the creation and operation of MHD-generators. The Institute of High Temperatures of the USSR Academy of Sciences in Moscow has been operating an experimental industrial unit U-25 for a long time (it has already been supplying power to the Moscow power system) and is designing an electric power plant for 500 MW. The Soviet-American and Soviet-Indian cooperative programs in the area of MHD-generators operating on gasified solid fuel started functioning in 1973.

The idea of burning Kansko-Achinsk brown coal effectively in MHD-generators is attractive. But where is there room for chemistry, more precisely, for coal chemistry? These questions of mine were answered in Krasnoyarsk.

In general, the power-engineering chemical scheme is as follows. We shall be burning not coal, but the product of its incomplete combustion -- carbonic oxide or carbon monoxide. Then, its molecules, combining with the oxygen of the air, will form carbon dioxide. The latter in the plasma state in the MHD transformer will become a source of electric energy.

However, this is not the end of the process. According to the idea of the authors of this power engineering chemical project, the jet of the "exhaust" carbon dioxide must go into a chamber (chemical reactor) which will contain dispersed (broken into minute particles) brown coal. It is known from chemistry that during the interaction of a molecule of red-hot coal with a molecule of carbon dioxide, there form two molecules of carbonic oxide.

This closes the cycle. We burned one molecule of carbonic oxide but obtained two! One molecule can be sent again into the cycle with the MHD generator, and the other remains at our disposal. It can become the basis for further chemical transformations.

In principle, it is possible to obtain the entire spectrum of those hydrocarbons which are traditionally connected with petrochemistry from carbonic oxide by adding hydrogen by the catalytic methods. For example, it is possible to produce benzines, ethylene, polyethylene, acetylene, methanol, and various other raw materials for the chemical industry.

Therefore, power engineering chemistry is combination of power engineering and chemistry.

There is practically no water in this scheme and, consequently, there is no thermal pollution of the Siberian rivers. There is no ejection of nitrogen oxide, other harmful gases and dust into the atmosphere. The scheme does not have the traditional tall GRES-type smokestack smoking day and night. According to estimates, the amount of carbon dioxide will constitute only 10 percent of the amount released during the ordinary burning of coal.

Ideally, the power-engineering chemical project is characterized by an entirely closed cycle both with respect to substances, and to energy; by the possibility of easily readapting the plant both in the direction of predominant production of electric energy, and, if necessary, in the direction of predominant production of chemical products; by a considerable increase in the efficiency of both the energy part of the scheme (to 45-55 percent), and the entire plant as a whole: by a decrease in the proportionate capital consumption and metal consumption due to the changeover to higher pressures and temperatures of many intermediate stages duplicating one another in individual power and chemical plants.

Moreover, the proposed scheme will include as its integral part a complex of special hothouses where agricultural crops will be grown under the effect of artificial light, carbon dioxide, and steam heat on special soils (on the basis of brown coal humates) by a rapid industrial method.

A New Outlook is Needed

Power engineering chemistry breaks up clearly into a power engineering part and a chemical part. I talked with the chancellor of the Krasnoyarsk State University, Doctor of Physical and Mathematical Sciences, Veniamin Sergeyevich Sokolov. He is one of the creators of a new and more advanced generation of MHD generators with the so-called T-layer.

T-layers are narrow local zones in plasma, according to V. S. Sokolov. The temperature in them is very high (in comparison with average plasma temperatures), therefore, their electric conductivity is high. Consequently, it becomes possible for MHD generators to operate on "clean" combustion products without alkaline additives... The new system has some other advantages: it is possible to obtain alternating current directly and to lower the average plasma temperature considerably. Consequently, it is possible to lower the requirements (which are quite severe) imposed on the materials from which the parts of MHD generators must be made...

In May 1978, at the request of the Krasnoyarsk territorial committee of the CPSU, the Presidium of the Siberian Branch of the USSR Academy of Sciences resolved to organize in Krasnoyarsk the Institute of Chemistry and Chemical Technology in order to provide for the chemical part of the project. Professor Sergey Pavlovich Gubin, doctor of chemical sciences, was appointed director and organizer of the new scientific subdivision.

Gubin said that the development of coal chemistry in the region is one of their main goals. But it is a special, nontraditional, coal chemistry. The power-engineering chemical processing of brown coal requires catalyzers and organic agents of various kinds. Coal chemists of narrow specialization will not be suited here. We need bold decisions and a new outlook on things.

In power-engineering chemistry, power engineering, plasma physics, coal chemistry, organic synthesis, and many other sciences are so interconnected, and the problems are so new that there is an urgent need of creating an intersectorial, interdepartmental, institute of KATEK problems.

Sciencists of Siberia and the Krasnoyarsk territorial committee of the CPSU believe that it is necessary to have a center which would concentrate on working out a general long-range plan for the development of KATEK. Its scale is too big to rely on individual initiative, even the most active one. For the time being, the Krasnoyarsk territorial committee of the CPSU and the scientific council created within it are acting as coordinators. But, naturally, they are unable to handle the multitude of problems in detail.

We must remember that this is a large-scale problem. Just as a small rock can cause an avalanche, seemingly minor miscalculations of the effect of this scale in solving KATEX problems may cause a number of serious complications and difficulties.

ELECTRIC POWER AND POWER EQUIPMENT

UNDERGROUND PUMPED-STORAGE ELECTRIC POWERPLANT TO BE BUILT

Moscow IZVESTIYA in Russian 26 Aug 78 p 2

[Article by A. Blokhnin]

> [Text] The engineers of Gidroproyekt [All-Union Planning, Surveying, and Scientific Research Institute imeni S. Ya. Zhuk] in cooperation with Belorussian power engineers have completed preliminary studies in connection with the forthcoming construction of a GAES [pumped-storage electric power plant]. The power of the GAES will be over one million kilowatts. It will be located to the southwest of the republic's capital.

One of the complicated problems of electric power engineering is the covering of the "peak" loads occurring during the morning and, particularly, evening hours. This problem is particularly acute for the European part of the USSR.

Here, a huge program of atomic power engineering construction has been developed, and a superlong Ekibastuz-Center electric line is being built. Power engineers have already come close to the realization of the project of transporting electric energy from the Krasnoyarskiy Kray, where, as is known, it is planned to create a gigantic electric power plant on the basis of the unique Kansk-Achinsk coal fields which will be tens of times more powerful than the Bratsk GES.

But what should be done with peak loads? Neither large thermal plants, nor AES are capable of changing smoothly their modes of operation adapting themselves to the morning and evening consumption peaks. Sharp changes in the load are inadvisable for them.

Hydroelectric power stations are ideal in this respect. But, unfortunately, there is no more room in the European part of the country for building large GES. Then engineers turned their attention to pumped-storage electric power plants (GAES). The first GAES has already been built and is operated successfully in the vicinity of Kiev. It works as an electric plant for four hours a day, and during the remaining time its powerful pumps pump water into the upper reservoir in order to store the "blue fuel" in this manner.

There are three new GAES under construction now: Zagorsk, Kayshadorsk (in Lithuania) and Leningrad (in the area of the Ladeynoye Field) GAES. Construction sites have also been selected for ten GAES with differences of over 100 meters between the levels. However, such differences in the heights are insufficient with the present demand for the "peak" power. For example, in order to have an yield of 1.2 million kilowatts at the Zagorsk GAES, it will be necessary to have 40 (!) times more water during the hours of its active operation than in the Moscow River.

The effectiveness of a GAES increases sharply as the pressure increases. If the water column is one kilometer high, the need in water will decrease to one-tenth of the amount required for a 100-meter threshold.

It is necessary to have mountains, but the Central European part is flat. While man is not strong enough to create artificial mountains, it is possible for him to lower the working reservoirs of the GAES deep under the ground surface, placing them on a crystalline "foundation".

Such a GAES will be built in the Minsk area. Spacious galleries will spread in different directions from the "mouth" of a one kilometer deep shaft. No casing will be required in the thick granite layer. The engine room will also be deep under the ground level.

The creators of superdeep GAES will have to solve many complicated problems. There are no unsurmountable obstacles. We have had sufficient experience in cutting deep shafts. The machine builders of the Leningrad Metal Plant and "Elektrosila" have confirmed that, in principle, it is possible to create reversible hydraulic units capable not only of taking the load of a kilometer water column, but also of ejecting the "waste" water to the surface from the gigantic underground well.

Where is it possible to build large underground GAES? There are large zones in the European part of the USSR where the continental rock is located at a distance of one kilometer and less from the surface. They include the entire Kola Peninsula with the Karelian Isthmus, and regions of the Ukraine, Belorussia, and the Chernozem Center of Russia.

These stations will yield tremendous advantages. According to calculations, the capital expenditures on GAES located 800 meters and more under the ground surface will be equal to the construction costs of stations of the same capacities on the surface. The average investment recovery time will be three to four years. However, if we take into consideration that underground GAES can be built according to standard designs and equipped with series-produced equipment, then the construction time of a station will not exceed four or five years.

It is also very important that undergound GAES will not ruin the natural environment on the surface. For example, the Belorussian station will operate using a large irrigation reservoir. The changes in the water level in it will not exceed 15-20 centimeters.

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ELECTRIC POWER AND POWER EQUIPMENT

CRIMEAN NUCLEAR POWER STATION REPORTED

Kiev RABOCHAYA GAZETA in Russian 5 Aug 78 p 3

[Article by S. Shantyr']

[Text] There appeared in Crimea a new construction site. The construction of an atomic electric power station has been started there. This site is a component of the construction program of nuclear stations in the European part of the USSR.

This region does not have any hydraulic resources. It would be possible to build a thermal electric power station, but, according to calculations, it would use every day, depending on the type of fuel, either 20,000 tons of coal or 10,000 tons of fuel oil, or 15 million cubic meters of gas. However, today's maximum gas supply to the peninsula is just a little more than three million cubic meters a day. There is only one solution: to build an atomic electric power station.

Will its construction be a threat to the unique nature of the Crimea? Millions of people come there from all parts of the country for rest and treatment every year. According to specialists, there is no such danger. Modern AES have great advantages in comparison with thermal electric power stations from the ecological viewpoint. A powerful thermal station ejects hundreds of tons of combustion products into the atmosphere and mountains of slag grow all the time.

The experience of the operation of atomic electric power stations in our country clearly indicates that the protection measures which are used make it possible to control the atomic energy absolutely and these measures are being improved constantly. Monitoring conducted in the course of many years indicates that the wastes of atomic power units are one-hundredth of the permissible standards and have absolutely no effect on the environment.

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ELECTRIC POWER AND POWER EQUIPMENT

GENERATOR OF THE FUTURE DESCRIBED

Moscow KRASNAYA ZVEZDA in Russian 23 Jul 78 p 4

[Article by R. Akhmetov]

[Text] The Dneproges [Dnepr Hydroelectric Power Plant imeni V. I. Lenin] will be a proving ground of the scientists of the Moscow Power Engineering Institute. It was decided to test there the world's first large high-voltage hydrogenerator which is capable of operating without a step-up transformer.

A. Ivanov-Smolenskiy, professor of the Department of Electrical Machines of the MEI [Moscow Power Engineering Institute] explained that at thermal and hydroelectric stations generators produce energy of up to 20 kilovolts. If energy of such a voltage is transmitted at long distances, then energy losses will reach 95 (!) percent. In order to lower the losses, the voltage in the electric power transmission lines is increased. Each generator has its own step-up transformer.

However, transformers are complex structures weighing hundreds of tons which require large amounts of scarce copper and special steel for their manufacturing. The idea of eliminating them was proposed by G. Petrov, corresponding member of the USSR Academy of Sciences. Theoretical studies conducted under his direction indicated that it is realistic to create a generator which could produce energy for the voltage required for its transmission at long distances. Specialists of the Sverdlovsk production association "Uralelektrotyazhmash", Perm plant "Kamkabel'", and Moscow Institute "Gidroproyekt" also started working on this problem.

Through their joint efforts, an experimental hydrogenerator for 110 kilovolts and a capacity of 15,000 kilowatts was built. It was installed at the Skhodnya GES in the Moscow area and worked successfully for about 2000 hours.

On the basis of the obtained results, a large machine for industrial purposes was designed for 165 kilovolts and a power of 104,000 kilowatts.

This new machine will produce the best economic effect at hydroelectric power stations built on mountain rivers. The faster the generator rotates, the

higher is its efficiency and the smaller can be its dimensions. Such units are promising, particularly, for the Chirkeyskaya and Nurekskaya GES.

The studies and experiments that have been conducted make it possible to approach the solution of a complex scientific and engineering problem: creation of high-voltage turbogenerators for thermal electric power plants of Siberia and the Far East.

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ELECTRIC POWER AND POWER EQUIPMENT

BRIEFS

GEORGIAN INSTITUTE HONORED -- Moscow, Kremlin, 5 Sep 1978 -- Ukase of the Presidium of the USSR Supreme Soviet on awarding the Order of the Red Banner of Labor to the Georgian Scientific Research Institute of Power Engineering and Hydroengineering Structures. For its important contribution to the development of hydraulic power engineering and water management construction, the Georgian Scientific Research Institute of Power Engineering and Hydroengineering Structures of the USSR Ministry of Power and Electrification is hereby awarded the Order of the Red Banner of Labor. Chairman of the USSR Supreme Soviet L. Brezhnev, Secretary of the Presidium of the USSR Supreme Soviet M. Georgadze. [Text] [Tbilisi ZARYA VOSTOKA in Russian 6 Sep 78 p 1] 10,233

ATOMIC MACHINE BUILDING PLANT -- The rapid development of nuclear power engineering in our country required a sharp increase in the output of large ingots, forged pieces and other metallurgical products. Specialists of Lengipromez [Leningrad State Institute for the Planning of Metallurgical Plants] and Lengiproenergomash [Leningrad State Institute for the Planning of Power Machine Building Plants] have completed a plan for the reconstruction and development of the association "Izhorskiy Plant" imeni A. A. Zhdanov. According to this plan, this oldest enterprise will become one of the main bases of atomic machine building. It is planned to create and introduce new capacities here for smelting and machining ingots of high-quality brands of steel weighing over 400 tons. According to N. Monakhov, chief engineer of the project, this decision is based on the utilization of the latest achievements of modern science and technology. Highly productive steel-melting furnaces of high capacities will go into operation. A new shop will be created for electric slag and vacuum remelting of large ingots. Heavy forged pieces will be produced in the new forge and press shop equipped with powerful presses of a force of 6000 and 12,000 tons. The foundry will also be radically reequipped. [Text] [Moscow IZVESTIYA in Russian 3 Sep 78 p 1] 10,233

NEW POWER TRANSMISSION LINE -- The members of the"Elektroapparat" association have started working on a new order. They have made the first of the series of electrical switches for 400,000 volts, which is unusual for the Soviet networks. The machines are intended for a rectifier substation whose construction has been started near Vyborg. It is a part of the complex of structures of the new "USSR-Finland" electric power transmission line. M. A.

Gorev, chief engineer of the electric power transmission, told the Leningrad TASS correspondent that this line is one of the largest power engineering projects of the northwest. Simultaneously with the construction of the "Vyborgskaya" substation, at which the current will be transformed from 330,000 to 400,000 volts and changed to the frequency of the power system of Finland, the reconstruction of the "Vostochnaya" substation and the expansion of the "Leningradskaya" substation were started. The new line will transmit four billion kilowatt-hours of electric power to our northern neighbor every year. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 1 Aug 78 p 2] 10,233

NORTHERN ELECTRIC POWER TRANSMISSION LINE -- The electric power transmission line which will connect the power systems of the Kola Peninsula, Karelia, and the Leningrad Oblast will be one of the longest lines of the northwest. The new line which is about 1000 kilometers long starts beyond the polar circle, where two units are already operating at the Kola Atomic Electric Power Plant. Some of the power is transmitted from there to the Karelian ASSR. The electric power transmission line of 330 kilovolts which is being built by Leningrad specialists from the trust "Sevzapelektroset'stroy" has already reached the region of Medvezhegorsk. Work is now in progress in the section from Medvezhegorsk to the capital of Karelia. It is planned to complete this section this year. When it is completed, the power supply to large industrial complexes operating in Petrozavodsk and its vicinity will be improved noticeably. I. M. Morkun, head of the department of long-range planning of northwestern power systems of the department of the "Energoset'proyekt", said that this line will be continued later to Petrozavodsk to the Verkhnesvirskaya GES, and from there to the "Syas'" substation in the Leningrad Oblast. The last section of the line will be the most complicated: there are many crossings with rivers, mountainous areas, and a large number of swamps. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 6 Aug 78 p 4] 10,233

KHUDONSKAYA HYDROELECTRIC POWERPLANT -- The first group of the builders and designers has arrived recently at the small village of Khanshi of the Mestiyskiy rayon of Svaneti to start the construction of the Khudoni Hydroelectric Powerplant. This group is headed by the construction director of the Ingurskaya GES, deputy of the USSR Supreme Soviet M. A. Tsiskarishvili, and by the director of the institute "Tbilgidroproyekt" I. M. Mgebrishvili and includes researchers, excavators, bulldozer operators, automobile drivers, road builders, sanitary technicians, and carpenters. The new station will be built 32 kilometers higher than the Ingurskaya GES and, together with the stations Tobari-1 and Tobari-2, which will be built later, will create the Ingurskiy cascade. The arched dam rises to 196 meters. The technical and economic substantiation of the Khudoni GES was prepared by the members of the design institute "Tbilgidroproyekt". [Text] [Tbilisi ZARYA VOSTOKA in Russian 2 Aug 78 p 4] 10,233

NUREK GES TRANSFORMER -- The installation of a block transformer in the last complex of the Nurek GES was completed yesterday two weeks ahead of schedule. The powerful transformer which was delivered by a cooperating enterprise from

Zaporozh'ye, is intended for transmitting electric energy to LEP [electric power transmission line]-500. Less than one month is left until the starting of the seventh unit. The equipment is being installed ahead of the deadlines. The eighth electrical machine is being assembled simultaneously. When these two units are put into operation, the Nurek GES will reach the capacity of 2.4 million kilowatts this year. [Text] [Moscow SOTSIALISTISCHESKAYA INDUSTRIYA in Russian 26 Aug 78 p 1] 10,233

SURGUT GRES -- Tests of the eighth power unit of the Surgut GRES have been completed successfully. It is the most powerful thermal station in Siberia and the Far East operating on gas which is extracted simultaneously with oil. Prior to the construction of this GRES the gas was burned in torches. The electric power of Surgut GRES is sent to oil and gas fields, to settlements of geologists and drillers. But the Tyumen north, where accelerated construction is in progress on a very large territorial industrial complex, country's main base for the extraction of oil and gas, requires more and more electric power. Therefore, the Surgut GRES is being expanded. At the end of last year, the first unit of the second section of the station was put into operation. Just as in the first section, it will have six units of 210,000 kilowatts each. It is planned to complete all work before the end of the five-year plan. [Text] [Kishinev SOVETSKAYA MOLDAVIYA in Russian 20 Jul 78 p 1] 10,233

NEW GES -- the Leningrad branch of the "Gidroproyekt" [All-Union Planning, Surveying, and Scientific Research Institute imeni S. Ya. Zhuk] received information from the shores of the Yenisey that the first barge with materials, equipment, and instruments for surveying had left Lesosibirsk. This was in connection with the large-scale and complex job of the Leningrad specialists who had started collecting material for the construction of new gigantic hydroelectric power plants on the great Siberian river and its tributaries. Yu. A. Grigor'yev, director of the Leningrad "Gidroproyekt" explained that tent settlements were set up in hitherto uninhabited places along the lower Yenisey. Surveying has been started for designing the Osinovskiy Hydroelectric Power Complex which includes three-four GES on the Yenisey and the Podkamennaya Tunguska with a total capacity of 6-8 million kilowatts. It is planned to build a still larger station for 8-10 million kilowatts -- Turukhanskaya GES on the Lower Tunguska in the Bol'shiye Porogi region. At the present time, every effort is made to deliver the necessary equipment and materials to the site. This winter, the surveyers intend to start drilling the bottom in the areas of the future GES. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 4 Aug 78 p 1] 10,233

INGOT FOR NUCLEAR REACTOR -- A gigantic high-quality steel ingot weighing 205 tons was cast yesterday by the metallurgical association "Izhorskiy Plant". It will be used to make one component of a nuclear power reactor with a capacity of one million kilowatts. This enterprise has started series production of the VVER-1000 apparatus whose pilot model was installed for the fifth block of the Novovoronezhskaya AES. This complex metallurgical operation was performed synchronously in two Martin furnaces and one electric melting furnace. F. A. Sivchik's brigade of melters started working first

in the morning. They melted the steel: 150 tons of metal with a minimal content of harmful impurities. The melted steel was poured into another furnace. It was brought to the required condition by V. N. Bashkov's brigade. Both Martin furnaces operated at maximum loads, one-fourth heavier than the norm. V. N. Petukhov's brigade had a responsible task. They prepared the insufficient 55 tons of steel whose composition corresponded exactly to the metal melted in the Martin furnaces. The operation was performed excellently under the direction of foremen M. S. Avdey and V. N. Kirillov. [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 5 Aug 78 p 2] 10,233

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FUELS AND RELATED EQUIPMENT

GAS INDUSTRY MINISTER INTERVIEWED ON PRODUCTION

Moscow PRAVDA in Russian 3 Sep 78 p 1 LD

[Interview with S. Orudzhev, USSR minister of the gas industry: "From the Subterranean Stores"]

[Excerpts] Oil and natural gas are the most precious raw material for the chemical industry and are an excellent fuel. The efficiency of social production and consequently the people's living standard now depend largely on the results of the work of the oil and gas industry workers. A PRAVDA correspondent asked S. Orudzhev, USSR minister of the gas industry, to describe how the workers of these sectors are fulfilling the targets of the five-year plan.

The development rates of the sectors are stably high, he said. The level of oil extraction over the first 2 years of the five-year plan has increased by 55 million tons and now the national economy receives over 1.5 million tons of "black gold" daily. The country's gas fields produced 346 billion cubic meters of gas last year, which is 2.2 times more than 10 years ago. A considerable increase will also be achieved this year. Behind these figures lies the strenuous labor of hundreds of thousands of people seeking to fulfill successfully the decisions of the 25th CPSU Congress.

We have succeeded in attaining particularly good results in the development of the west Siberian deposits. This spring a notable event was celebrated--the one-billionth ton of Siberian oil was extracted from the depths of the earth.

The unified gas supply system was formed rapidly in our country and is operating successfully. From the deposits of the RSFSR, the Ukraine, Turkmenia, Uzbekistan, Azerbaijan, Kazakhstan and Tadzhikistan pure, highly productive fuel travels along subterranean arteries about 120,000km long to consumers in all 15 union republics and abroad. Now 182 million people in the USSR consume natural and condensed gas.

The main task facing us today is to bring into play in good time all planned capacities for the extraction, refining and transportation of oil and gas.

Only in these circumstances will the national economy's constant provision with fuel be insured in the fall and winter period, which will undoubtedly be a strict task master.

The scales of consumption of fuel in the national economy are growing rapidly and the assimilation of new deposits located mainly in remote regions requires efforts and enormous capital investments. Oil and gas are our national possession. The resources of great value must be expanded particularly thriftily.

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FUELS AND RELATED EQUIPMENT

OIL MINISTER SALUTES INDUSTRY'S WORKERS ON HOLIDAY

Moscow IZVESTIYA in Russian 3 Sep 78 Morning Edition p 1 LD

[Interview with N. Maltsev, USSR minister of the oil industry: "Masters of Nature's Stores" by correspondent V. Sukhachevskiy]

[Text] On the eve of the professional holiday of the oil and gas workers and construction workers for the oil industry enterprises, IZVESTIYA correspondent V. Sukhachevskiy asked N. Maltsev, USSR minister of the oil industry, to describe how the sectors' collectives feel on this day and what their immediate plans are.

The production collectives are welcoming their holiday in an atmosphere of high political and labor enthusiasm, the minister said. Responding to the letter of the CPSU Central Committee, USSR Council of Ministers, AUCCTU and Komsomol Central Committee, the oil workers, gas workers and construction workers have launched competition for the fulfillment of the plans of the first 3 years of the five-year plan by the first anniversary of the new USSR Constitution. Already the 1,040 best teams, crews, columns, sectors and shops and over 19,000 leading production workers have reported to the motherland that they have honorably kept their word. In the first 8 months of this year the country has received about 6 billion cubic meters of gas and over 800,000 tons of oil and condensed gas over and above the plan. Over this period about 5,000#km of main pipelines and dozens of compressor and pump stations were constructed.

The first stage of the assimilation of west Siberia's oil and gas resources has been successfully completed. Each of us proudly carries in his heart the words which comrade L.I. Brezhnev uttered from the rostrum of the 25th CPSU Congress about the conquerors of the Siberian depths: "What has been done and what is being done in this harsh region is a real feat. And the motherland pays a tribute of admiration and deep respect to the hundreds of thousands of people who are accomplishing this feat."

Naturally, I should like to speak of the workers of the oil industry. Over 300 of the best collectives have already fulfilled the plans for the first

3 years of the five-year plan. This is a fitting gift from the oil workers to the first anniversary of the USSR Constitution. Among the competition leaders are the teams of drillers, oil extractors and well repair workers headed by V. Agafonov, M. Shirokov, I. Sayapov, D. Nurutdinov, T. Pisarenko, M. Gambarov, V. Kulakov, R. Fayzullin and many others.

The CPSU Central Committee and the Soviet Government display constant concern for the development of the oil and gas industry. In response to this concern, in the first 2.5 years of the Tenth Five-Year Plan the oil industry workers have increased the extradition of oil and gas condensate by over 70 million tons. That is the amount of oil and gas condensate extracted throughout the country as a whole in 1955.

Attaching special significance to the development of the west Siberian oil and gas complex, the party and government recently instituted the medal for opening up the underground resources and developing this region. A large group of the most distinguished oil and gas industry workers, geologists and construction workers have been decorated with this award of the motherland on the eve of our holiday. The recipients of the award include west Siberian oil industry veterans heroes of socialist labor A. Timchenko, G. Levin, G. Petrov, A. Shakshin, S. Yagafarov and others.

Speaking of achievements of the oil industry workers of west Siberia, Komi ASSR and Udmutriya who are providing the main increase in oil extraction, we are rightly proud also of the remakable deeds of the oil industry workers collectives of the Ural-Volga region, Caucasus and Transcaucasus and Central Asia and Kazakhstan which are showing models of highly productive labor.

The oil and gas industry workers and the construction workers involved in the construction of the enterprises of these sectors are concentrating their attention on the practical solution of the tasks of the rational and highly efficient use of fuel and energy resources and the extensive introduction into practice of the achievements of scientific and technical progress, which will make it possible to satisfy more fully the national economy's requirements for oil and gas.

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FUELS AND RELATED EQUIPMENT

SAYANO-SHUSHENSKAYA 'GES' STARTUP DEADLINE IN JEOPARDY

Moscow IZVESTIYA in Russian 28 Jul 78 pp 1-2

[Article by the IZVESTIYA brigade of I. Dement'yeva, V. Gavrichkin, A. Yezhelev, O. Pavlov, A. Plutnik, B. Petrov, A. Sabirov and Ye. Yakovlev: "The Startup Year of the Sayano-Shushenskaya GES"]

[Text] When you look down on the construction project from above—from a high cliff, to where the dam's crest is being raised—from the platform of a temporary cofferdam beside the headquarters, we become aware of the magnificence of what is taking place, and it is not so easy to make sense of the palisade of cranes, the labyrinths of passages, the concrete cubes of various heights and columns, the interweaving of reinforcements, and the pipes and rails. BelAZ's [trucks of the Belorussian Motor-Vehicle Plant] howl and carry mix. A siren sounds and above our heads, above the electrical welders' flashes, which show up everywhere, the arm of a crane moves, lifting into the air a 25-ton bucket of concrete. Backing up toward the cliff a dump truck pours gravel. Today they are laying rails here and by tomorrow a high-capacity crane will be moving along them.

Everyone is hurrying and rushing. And we would like to gain some insight into whether behind this general bustle there is firmness in the guiding calculations that join together the efforts of the collective and the remaining time. For the builders do not have much of it at their disposal. "1978, December. STARTUP,"—urge the letters, 0.71 meter high, of an appeal on the girder of a crane.

On 22 December of this year, on Power Engineers' Day, the first unit of the Sayano-Shushenskaya GES should generate current. The builders of the power plant have timed this significant day for their holiday. And the startup itself is planned. The observance itself of the deadline is equivalent to carrying out the state task.

This time when the two concepts—Sayano-Shushenskaya GES and startup—were joined together has approached surprisingly rapidly. The period from the spanning of the Yenisey to startup of the first unit here has been reduced by 1½ years in comparison with the Krasnoyarsk power station. Giving the

builders' enthusiasm its due, let us also note in so doing that they have at their disposal equipment that is more modern than previously.

Do you recall how personnel in the film history of Dneproges [Dnepr Hydroelectric Power Plant imeni V. I. Lenin] compacted the concrete there? Construction workers shod in bast shoes, joining hands, stamped their feet in a dance in the pliable, living mass, which was like a swampy quagmire! Those times have long since passed. At the Krasnoyarskaya GES the concrete was compacted by mechanical vibrators, but at Sayany a monitor does this, a machine mounted on the base of a swamp tractor. Its productivity is 20 times that of vibrator operation.

The cranes which today deliver concrete to the blocks of the Sayany dam have twice the capacity of those at Krasnoyarsk. Instead of wooden formwork, a cantilever form for repeated use is employed. In order to clean the units, a machine based upon a battery-operated truck has been developed. An enormous "dust pump"—a vacuum cleaner—does the cleanup work on the finished block. The majority of these mechanisms were born at the Sayany construction project or were created at plants especially for the project.

Boldness of engineering concept has accompanied the construction of the Sayano-Shushenskaya GES from the very start, and, more precisely, it was an accompaniment to the scheme of its creation. There were also many interesting decisions connected with startup of the first unit. Formerly, it would be possible to start up the first unit and obtain current only with completion of 70 percent of the total volume of construction at the station. But this will occur here with the fulfillment of only 42 percent of the construction volume. How? The station's hydroelectric units (the capacity of each is 640,000 kw) can operate when a constant reservoir level of 125 meters is reached. But the dam will not reach this height so very soon. Lengidroproyekt [Leningrad Branch of the All-Union Design, Surveying and Scientific-Research Institute imeni S. A. Zhuk] designers proposed to equip the first two units with temporary replaceable runners that can begin to operate at a dam height of 60 meters.

This temporary, lightweight runner with a weight, by the way, of 90 tons, has already been delivered from Leningrad. Hanging on the crane's cables, the wheel was raised above the Yenisey's shores and an enormous bright red strip is seen from a distance. A few days later and it will be lowered into the shaft and occupy its operating position. More accurately, this should occur, but the construction project still remains on schedule.

Even from a distance it is easy to make out the site at which work connected with startup of the first unit is proceeding.

The metallic rims of the generator's "drum" has been lifted, and a giant water conduit stands from the intake channel to the crater.

"The main thing right now is to get everything necessary done before 15 August, so that from then on Elektrosila plant specialists will have a

a work front and will be able to start assembly of the generator's stator," deputy chief engineer of the construction project V. Gubarev told us.

The generator's stator will be assembled directly at the construction project—this also is new in domestic hydroelectric-power construction practice. Formerly this was assembled at the plant, and the construction project was concerned only with installing the assemblies. Now the assembly will be accomplished directly at the GES building, which is under construction. And the Elektrosila workers will need an environment which approaches that of the plant to the maximum: absolute cleanness, definite temperature and humidity of the air....

The builders still have many matters to attend to. By the time the first unit is to be started up, work on the dam's foundation is to be completed, and all the gates, of which there are 10, will have been installed. The temporary cofferdam will be demolished, and on the first of December the Yenisey's waters should be moving over their main permanent streambed.

Finally, this year, the year of major concrete work—almost $1\frac{1}{2}$ million cubic meters of it are to be poured. For a long time now we have not been astonished by astronomical figures but have become accustomed to them. And so we recall that during all the preceding years of construction of the station, 2 million cubic meters of concrete were poured, but now $1\frac{1}{2}$ million in 1 year.

How are the builders coping with these previously unheard-of amounts of work? Will they manage to do everything necessary by 22 December?

No, they will not succeed. The first unit can be introduced into operation in March 1979, according to the decoding of information given by an electronic computer. Perhaps the program compilers have expressed excessive caution. But somehow or other, possible dates for startup of the first unit were calculated at one of the computer centers, and this uncomforting answer was obtained.

"The computer deals successfully with logical constructions but it is not adapted to emotions; in particular, it does not possesss a feeling of optimism," chief builder S. Sadovskiy comments on this matter. "The whole collective of builders, and I include myself in them, is confident that the startup will take place this year."

Our collocutor speaks about "the human factor," which today plays a most important, and very often, the decisive role, at a construction project. The collaboration of Leningraders and Sayano-Shushenskaya GES builders has become a new word in the organization of the work of subcontracting collectives, both at the construction project itself and far beyond its borders.

The idea of organizing a start-to-finish concrete-pouring assembly line was born as a development of "the workers' relay race." Last year P. Burmakin, the brigade leader of MAZ [Minsk Motor-Vehicle Plant]

concrete-carrier drivers, together with his comrades, undertook to deliver 1,200 cubic meters of mix per shift. However, the drivers' undertaking makes sense only if the concrete plant produces the required amount of mix. The crane operators are coping with this amount, and the brigade of carpenters and concrete workers can pour this amount of concrete into the blocks. And collectives which decided to support the drivers' initiative were found in all sections. Thus one integrated-process shift was created from subcontractor brigades that were subordinate to various administrations. The first experience in this work produced a first record—1,240 cubic meters of concrete poured in a day. Soon the shift schedules in all subunits—the concrete plant, the motor pool, the foundation-structures administration—were arranged around this calculation, so that all elements of the integrated-process shifts became permanent coworkers and operated as a unified collective. Thus was born the integrated-process concrete-pouring assembly line.

First Secretary V. Tolyup of the Sayanogorsk GK [city committee] of the CPSU told us about the initiative of the three brigades, on which the success of operations at the site of the first hydroelectric unit primarily depends today. The carpenters and concrete workers under V. Poznyakov and S. Kolenkov and the installers of V. Demidenko's brigade have concluded among themselves an agreement about working collaboration: each of these collectives will present a work front for each other in turn, precisely in accordance with the schedule.

An out-of-town meeting of the Board of the USSR Ministry of Power and Electrification took place here the day that we were at the site. They reviewed all questions and weighed each decision connected with startup of the station's first unit. And it is no accident that, along with the managers and supervisors of the ministry, the construction project, design organizations and supplier plants, brigade leaders well known to us—V. Demidenko, S. Kolenkov and V. Poznyakov—also addressed the out-of-town meeting of the board. After listening to the talk of V. Demidenko, Minister of P. Neporozhnyy asked:

"What kind of an education do you have? All your proposals are worthy of engineers and specialists of a high class."

"I have a secondary school education, Petr Stepanovich," answered the brigade leader, "but I have some experience. I built the Krasnoyarskaya GES and I was at Bratsk and Ust'-Ilimsk."

Yes, the epaulettes of our hydroelectric construction that are best known in our country are on the shoulders of installer Vyacheslav Demidenko. And Valeriy Poznyakov's experience was gained at the Krasnoyarskaya and Nurekskaya GES's, and Sergey Kolenkov was a rank-and-file carpenter and concrete worker in one of the celebrated brigades during construction of the Krasnoyarskaya GES. At the Sayany dam he himself headed a collective and became a prize winner of the Leninist Komsomol. Three years ago he was given the honorary right to start the floor slab for the Yenisey at

Sayany. The Sayano-Shushenskaya GES construction project holds onto such people.

The presentations themselves of the brigade leaders were not at all like reports of victories won. It was a matter of those things that impede operation. They spoke about what is painful, strictly workmanlike, directing cricicism at the management of the construction project and of many other organizations. Minister P. Neporozhnyy completely analyzed the stand of the working brigade leaders, noting that the construction project still had not achieved either the strenuousness or the pace of a facility due for startup.

Yes, even now the capacity of new equipment still is not being used fully. Not one of the thousand-tonner cranes has yet reached steady design productivity, primarily because of various organizational disorders. The organization of operations also provokes the greatest censure. A worker initiative was aimed at achieving full cooperation of all elements. But this striving is not always being sustained by well thought-out organization. Take the initiative for the concrete-pouring assembly line. It was not able to influence progress of the job decisively, since the schedule was constantly being reduced, and arrears for pouring concrete not only has reached 100,000 cubic meters but it continues to grow.

"We must enclose the machine-room floor of the first unit as quickly as possible. But this depends upon the concrete operations of the ninth and tenth decks of the shaft. And these, in turn, depend upon the reinforcement workers," chief of the construction site's operating engineering section V. Fedyukov explained to us. "And so an empty pie results: we support each other and we interfere with each other on this small platform."

Precise coordination on the "small platform" of the first unit and on the scale of the whole construction site determines success of the operations. Management of the construction work and of the numerous party organizations are doing very much today to assure that what has been neglected will be made up by the middle of August and that things will get back on schedule. The collective itself has set these dates.

The startup of the first unit of the Sayano-Shushenskaya GES depends not only upon the builders who are busy today at the site of the future station. The collectives of many enterprises are coordinating with them, but, unfortunately, not always successfully. The quality of the cement provokes the builders' censure, and deliveries from the Moscow Cable Plant worries them. We shall not continue the list. We recall only that those who today are engaged directly at the construction construction project are forced to overcome any organizational deficiencies, delayed deliveries and schedule interruptions through their own efforts, inventiveness and energy—they have no other way out, they are committed to starting up the first unit on 22 December. In this case, one must not abuse the "human factor," covering up one's own lapses and the suppliers' lack of discipline with the builders' enthusiasm.

The biography of every large construction project has landmark events. For the hydroelectric power station builders, these events are the start of the hydraulic operations, the first concrete, the dam, the startup of the first unit....And in the intervals between these days, which are mostly holidays, are hard days and regular work days.

At the entrance to the hydroelectric-power builders' village of Cheremushka stands a transparent banner, on which the figures are changed daily: "....days remain before startup of the first unit." Today the figure "147 days" stands on this "chronometer."

The 147 days left until startup of the first unit of the Sayany giant are not very many.

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FUELS AND RELATED EQUIPMENT

NEW STAGE OF TYUMEN' DEVELOPMENT

Baku VYSHKA in Russian 19 Aug 78 p 1

[Article by Konstantin Vladimirov: "Tyumen': New Stage of Development]

> [Text] This past spring, the wells of Western Siberia produced the one billionth ton of petroleum since exploitation of the deposits there began. The development of this harsh land and the problems facing the builders of the fuel and energy complex in the second stage of its development are the subject of the report by journalist Konstantin Vladimirov.

Having become the country's main fuel base, Western Siberia is supplying "black gold" not only to the plants of the Urals and the Center but also to such traditional petroleum producing regions as Baku and Groznyy, Tataria, and Bashkiria. The transcontinental pipeline Druzhba is carrying Tyumen' petroleum to the fraternal socialist countries.

Here are the figures characterizing Tyumen's production fields today. This year they will deliver to the national economy about 250 million tons of petroleum and 100 billion cubic meters of gas. This is as much as was produced in all of the country just 10 years ago.

It is wrong to think that Siberian petroleum runs like a river and, so to speak, just flows into our hands. In order to drill wells in swamps it is first necessary to build earth-fill islands. To get to the new fields it is necessary to cross the impassable taiga, laying unique roads made of huge logs or else building winter roads of snow. In Tataria, for example, one kilometer of highway or railroad costs about 40,000 to 50,000 rubles; in these remote regions, the price goes up to 500,000. Tens of thousands of tons of all kinds of freight have to be brought here over hundreds of kilometers by aircraft and helicopters, which also don't come cheap.

The enterprises of many ministries and departments ware working for Tyumen'. They are turning out equipment and machinery, special equipment made for northern conditions, capable of withstanding severe temperatures. Some of

the equipment has to be purchased abroad. A huge detachment of scientists in Moscow, Leningrad, Kiev, and Novosibirsk is working to implement the Western Siberian program.

"...In the next 10 years most of the increase in the production of petroleum, gas, and chemicals made from them will have to come from Tyumen'," said L. I. Brezhnev at the Eighteenth Komsomol Congress. "In connection with this, a new and more complex stage of development of Western Siberia is near at hand, or rather has already arrived. It is necessary to double or triple volumes of work there. This will require new material-technical outlays and an influx of people."

What are the main characteristics of the next stage of formation of this fuel and energy complex? What new tasks face those who are developing these underground treasures? Here are some examples to these questions by the managers of the main production subunits launching the assault on Tyumen's mineral riches.

Feliks Arzhanov, chief of USSR Ministry of Petroleum Industry's Glavtyumenneftegaz [Main Tyumen' Petroleum and Gas Administration]:

"The famous Samotlor field, which has provided the main increase in production, has reached projected capacity. Now we turn to the smaller deposits discovered by geologists in inaccessible northern regions far from communications and industrial bases. Development of these is already underway.

"The success of the matter will largely depend on the drillers. In the final year of the five-year plan we will have to drill more than 12 million meters. To help Tyumen's drillers, the USSR Ministry of Petroleum Industry has brought in crews from Bashkiria, Tataria, Kuybyshev, and Saratov."

Yevgeniy Altunin, Ministry of Gas Industry's Tyumengazprom [Tyumen' Gas Industry Association]:

"For us the second stage of development of Western Siberia is linked chiefly to the development of the Urengoy gas field, the largest in the world. The overall program of development of the gas deposits in Northern Tyumenskaya Oblast is not smaller in scale than the work being done in the Ob' petroleum region. In terms of complexity, however, it is much larger is scope. Most of the reserves of Tyumen' gas are concentrated in the permafrost zone. All it takes is a small disruption of temperature conditions that have developed there over the centuries, and the soil begins to drop away literally under your feet. Soviet scientists, builders, and operations workers have, for the first time in world practice, successfully resolved a number of very difficult scientific-technical problems relating to the organization of the production and transport of gas under these unusual circumstances."

Mikhail Chizhevskiy, chief engineer of USSR Ministry of Construction of Petroleum and Gas Industry Enterprise's Glavtyumenneftegazstroy [Main Tyumen' Administration for the Construction of Petroleum and Gas Industry Enterprises]:

"Along with the petroleum workers and gas producers, we have to develop northern fields to which freight can be delivered only by winter road or by air. This requires a completely different approach and new planning and technical solutions.

"Many solutions have already been found. For example, widespread use is made of the block-complex method of construction. In essence it consists of the following. Plants in Tyumen' build block containers with all of the necessary technological 'gear'--equipment, fittings, instruments, and automation. Each such block represents a kind of cell of the future structure, one which is compact and convenient to ship by any means of transport. Then the finished blocks are delivered to the site, placed on the foundations, and joined together. On the field itself, therefore, there is practically no construction work in the usual sense of that word. All you have is the installation of blocks of high factory readiness."

Petroleum and gas constitute the foundation of the Western Siberian complex. But, as is well known, the foundations marks only the beginning of a project. The new stage of development calls for building petrochamical facilities on the basis of local resources. They will include huge enterprises making use of advanced technologies and up-to-date equipment.

On the banks of the Irtysh, on the edge of the ancient Siberian city of Tobol'sk, work is already underway on the buildings of a petrochemical combine. A huge gas fractionation unit--the first phase in the project--will provide raw materials to all the present enterprises in the synthetic rubber industry.

Another giant petrochemical facility is being built in neighboring Tomskaya Oblast. Dozens of kinds of chemical products will be produced there: polyethylene, polypropylene, methanol, benzene, and divinyl...

This is by no means the whole picture in the development of Western Siberia's petroleum deposits. In 1978 another eight are to be developed. At the end of the current five-year plan, the annual production there should rise to between 300 and 310 million tons.

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PROGRESS, PROBLEMS IN TYUMEN' DEVELOPMENT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Sep 78 p 2

[Article by Yu. Loganov, chief engineer, Glavtyumengeologiya (Tyumen'): "Tyumen' Acceleration"]

[Text] For the past two years, Glavtyumengeologiya [Main Tyumen' Geology Administration] has failed to complete the petroleum reserves increase plan. This has had a negative effect on the work of those extracting the "black gold" of Western Siberia.

Tyumen's geologists are prospecting from the snowy spurs of the Urals to the ancient Yenisey, from the blazing steppes of Kazakhstan to the frozen Kara Sea. Working on this enormous territory of 1.5 million square kilometers are dozens of prospecting parties and petroleum and gas exploration expeditions. Their distance from the main administration has made it impossible to exercise routine supervision over the collectives. The result has been "spinning of wheels," missed targets, and unfulfilled plans.

This year the task is even more complex: it is necessary to drill 830,000 meters of deep exploratory wells--1.5 times more than last year. Petroleum prospecting is scheduled in 30 new fields. Such a pace is unprecedented in the country. And ahead lie jobs of even larger scale. At the Eighteenth Komsomol Congress, Comrade L. I. Brezhnev emphasized that Tyumen' reserves must supply us for many years to come. In the next 10 years, the main increase in the production of petroleum, gas, and chemicals for the country must come from Tyumen'.

What measures have we taken to accomplish these tasks?

On the basis of the recommendations of economists, the administration has begun to set up production associations for petroleum and gas exploration. Four of them are already in operation--two in the Middle Ob' region and two in the Northern Yamal region, each of which have "locked in" three or four expeditions. Having assigned to the associations the resolution of current problems, the administration's apparatus has gained the possibility of working on the long term.

Our rising volumes of prospecting and exploration have made it possible, for the first time in the sector, to specialize particular operations--drilling, rig construction, field geophysics, and automotive shipping. What is the result? First of all, labor productivity has risen greatly. In the first half of last year, our rig installers built only 110 rigs; this year, practically the same number of crews has built 146. The rig builders are now allocated aircraft and automotive transport on a regular basis, material and tool supplies have been improved, and crews are now transfered from point to point more efficiently. Compared with last year, idleness due to this factor has been reduced by 1.5 times.

Specialization has also made it possible to concentrate manpower on the most important projects and to maneuver the crews. Last spring, for example, A. N. Grekov's crew at Urengoy, which did not have an operations front of its own in the expedition, drilled a well in the exploration area at Tarko-Sale.

Specialization of automotive transport has helped in delivering most of the freight for all of the expeditions over winter roads. In March, a joint detachment made up of 50 KamAZ's [Kama Motor Vehicle Plant Vehicles] carried 1,500 tons of fuel and 500 tons of cement 500 km from Surgut to Tarko-Sale. A year ago this would have been impossible--each expedition had its own transport shop, and it was difficult to get the chief of one expedition to help his neighbor: as a rule, he had his own load to carry.

Specialization has also brought into being a new form of socialist competition among us--on the basis of an agreement of collaboration. The first to conclude such an agreement were the Megion expedition, the rig installation office, and the automotive transport enterprise. The main point of the agreement was for each organization to act in concert to fulfill plans.

The Megion people achieved high results: drillers are almost one-half month ahead of schedule, the "riggers" have turned over 25 rigs to them on schedule, and the transport workers, handling the shipping for both of them, have completed their own plan by 128 percent. The colleagues are helping one another in everything, knowing that their own success depends on this.

In restructuring the organizational chart, we also dealt with its basic link--the crew. The experience of the leading collectives headed by foremen V. A. Makar, V. S. Solov'yev, and A. A. Khalin, has shown that traditional four-watch crews can work much more productively if they are reinforced by one or two repair-preparation watches. Thanks to this alone, V. S. Solov'yev's crew had not a single day's idleness (last year, idleness amounted to about three months), drilling more than 25,000 meters of wells and completing the year's program one-half year ahead of schedule. This made it possible for the crew to revise its obligations: they decided to drill 30,000 meters by the anniversary of the USSR Constitution, three months ahead of schedule.

The experience of the leaders suggested to us a clever variant: today, repair-auxiliary links are operating effectively in all of the petroleum exploration expeditions.

An analysis of the work of past years has shown that one of our main errors was an unjustified reduction in volumes of prospecting drilling. Our main efforts were concentrated on completing the exploration of "old" fields. There were fewer discoveries. This in particular led to failure to meet the reserves increase plan. Today the administration has revised its position: 40 percent of our total drilling volume is for prospecting. As a result, we have already discovered six new fields.

All indicators have improved sharply this year: drilling has increased by 1.5 times, and gas reserves have been increased by 270 billion cubic meters above target.

Drilling deep wells in the Far North entails substantial problems: the complicated geological structure and zones with abnormally high formation pressures and permafrost require a completely new approach to the technology of well construction. Unfortunately, our own ZapsibNIGNI [expansion unknown], carried away by prospecting forecasts, has been little concerned with drilling problems. Nor does it have the necessary laboratory-production base or enough specialists.

As the years pass, drilling problems will not diminish but rather become greater, and for this reason it is essential to create a scientific research drilling institute within Glavtyumengeologiya.

The rise in drilling volumes makes it mandatory to seek out new forms of organization of labor. At present we are operating with 56 drilling crews; by the end of the five-year plan we will have to raise this number to 100, and by 1985 Glavtyumengeologiya will have to have substantially more drilling crews. There must be a corresponding rise in the number of rig installation crews and well testing crews. Without the help of other geological regions, Tyumen's geologists will not be able to handle these tasks. Now, excellent contact has been established with the geological-exploration workers of Belorussia. A. K. Kalashinskiy's drilling crew from Belneftegazrazvedka [Belorussian Petroleum and Gas Exploration Trust] has been working in Megion. Excellent work has also been done by the rig installation crew headed by P. S. Vasilevich from the same trust, who completed construction of a rig ahead of schedule in the Pravdinskaya petroleum exploration expedition.

In organizing the work of crews from other regions of the country, extensive use is being made of the watch method, in which the drillers, having worked a certain amount of time in Tyumenskaya Oblast, go home to rest. Doing so, they retain all of their northern benefits. Initial experience indicates that this promises substantial reserves, and it will become possible to utilize drilling, rig-installation, and testing crews available in the sector more effectively in Tyumen'.

Industry personnel are broadly supporting the pioneers of Tyumen'. They consider orders from the Siberians to be a point of honor. The Siberians are getting equipment ahead of schedule from the Baku machine building plants imeni Kasimov, imeni Leytenant Shmidt, and imeni Sardarov, the Bukhara repair-mechanical plant, the Novocherkassk Neftemash Plant, and many others. Unfortunately, some enterprises are behind in deliveries. Uralmash has failed to deliver seven BU-3000BD deep well drilling rigs, the Volgograd Barrikady Plant has failed to deliver 20 sets of blowout preventers and 80,000 rubles worth of spare components for BU-80 and BU-75 rigs, the Syzran' repair-mechanical plant of the Ministry of Petroleum Industry has failed to deliver four buildings of the openwork type, and the Kishlinskiy machine building plant has failed to deliver nine Azinmash-43A units. These failures make it impossible for us to get the equipment to the exploration sites during the navigation season and put it into operation on time.

The party and the government have placed high trust in the geological exploration workers. But their responsibility is also high for implementing the ambitious program of the development of the North. And the geologists guarantee that Tyumen's mineral riches will continue to gratify our homeland.

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FUELS AND RELATED EQUIPMENT

PAVLODAR OIL REFINERY STARTS MAKING BOILER, DIESEL FUEL

Moscow TRUD in Russian 27 Jul 78 p 1

[Article by V. Minasyan (Pavlodar, Kazakh SSR): "Automated Equipment Does the Controlling"]

> [Text] The Pavlodar Oil Refinery has been put into operation. Its first phase has produced finished product—fuel for boilerrooms and diesel units. Siberian crude oil is arriving in Kazakhstan by multikilometer pipeline.

"In Pavlodar we are starting up a refinery completely for the first time in our experience," brigade leader N. Proskuryakov of Moscow's Orgneftekhimzavod [State All-Union Trust for Startup, Setting-up and Design Operations for Oil Refineries and Petrochemical Plants] told me on the eve of this event. "Previously, the industrial setting up of installations was done by units, in stages. This innovation shortened the enterprise's startup by half a month. Try-out and introduction of the high-capacity oil-refining installation were done in unison with other preparatory operations. The equipment for the prescribed industrial regime was erected strictly on schedule. The setting-up personnel countered the difficulties with their experience and skill. They understood that the success of the forthcoming grain harvest on the boundless expanses of Kazakhstan's virgin lands will depend greatly upon the refinery's startup. Indeed, it is to virgin-land sovkhozes and kolkhozes that the Pavlodarites are to send fuel during the current harvest season, for the farm-machinery and tractor fleet."

However, the brigade leader could not interrupt his work for long at such a strenuous time. The command for unit No 1's readiness has been received. The whole department is seen well from the platform of the central control panel. It is difficult at first glance to get a clear understanding of even where the main process line runs. In toto, more than 500 complicated pieces of apparatus are distributed over a small area here. Helices of varicolored steel pipe of various diameters extend along them. There are almost no people. The oil-refining processes are controlled automatically. Workers in coveralls stand watch in the various sections only at the most important spots.

"The oil has moved," reported senior operator V. Korchagin.

At this same instant signal lights on the control panel twinkled and sensitive instruments began to move. The workers apparently did not give way to emotion. Each was engaged in his job—the crude oil should become fuel, which will put combines and tractors into operation and furnish heat for kindergartens and apartment houses. And it was noteworthy that workers from the city of Omsk were working hand in hand with Kazakhstaners during these minutes. The workers from Omsk—senior operator V. Korchagin, furnace operator A. Starchenko, instrument control man of the electrical desalination installation A. Artem'yev, and others—were to check the most important sections. They, cadre workers of the oil-refining industry, are transmitting their rich experience to the Kazakhstan friends and, together with them, are starting up the refinery.

"The fraternal assistance of the Omsk workers," says refinery director V. Brendesh, "helped us to train worker personnel in a short time and to cut the time devoted to the startup and setting-up operations."

And another thing attracts specialists here: the most modern oil-refining equipment has been distributed very compactly here at the Pavlodar refinery. As the enterprise director emphasized, this has enabled the metal-intensiveness of production and the manning by operating personnel to be cut in half. Under the concept of the planners and designers, the Pavlodar refinery should become a demonstration model for the industry.

...And the joyful news spreads from department to department: a stream of diesel fuel has begun to fill an enormous tank. Simultaneously, another important product—boiler fuel—was obtained. A brief entry was made in the quick-analysis journal of the plant's laboratory: "The quality meets the GOST [State All-Union Standard]." Above the department's blue pipes hangs a red transparent sign: "There Is a Pavlodar Oil Refinery!"

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FUELS AND RELATED EQUIPMENT

ACCELERATED OPERATIONAL DRILLING IN AZERBAYDZHAN URGED

Baku VYSHKA in Russian 2 Aug 78 p 1

/Editorial: "Faster and Better Drilling"/

/Text/ VYSHKA recently reported the experience of the collective of the Bulla Maritime Exploratory Drilling Administration, which has been steadily raising its drilling speed every month despite extremely difficult geologic conditions for drilling wells, the deep lie of the productive strata, and its considerable distance from the bases of technical-material supply. According to the last half-year's results, this collective has achieved the best indices in the Kaspmorneft' Association: They drilled nearly 2,000 meters above the plan, exceeded the planned drilling speed by 117 meters, and used 78 percent of the productive time (compared with the association average of 65.3 percent). And what is most important, they did high quality work without a single accident.

A good many drilling collectives in the republic's oil industry have improved their main technical-economic indices lately. The Sangachaly MUBR /Maritime Administration of Drilling Operations/, the biggest in the nation in the number of simultaneously operating drilling machines, completed its 7 month crash program 5 days ahead of schedule and made an above-plan profit of more than 900,000 rubles by speeding up its drilling and by expending its material resources rationally.

The Apsheronskiy UBR /Administration of Drilling Operations/ has increased its drilling speeds over last year, and the Gobustanskiy URB /Exploratory Drilling Administration/ has begun to drill boreholes faster. Brigades of the latter are prospecting for reserves of natural fuel throughout practically the whole republic. By using the advantages of their new equipment, the offshore prospectors have increased their drilling speeds by 100 meters above the plan, drilling boreholes with floating drilling equipment.

The leading workers' experience clearly indicates that the drillers of Azerbaydzhan have ample opportunities for accelerating drilling and shortening the whole cycle of oil well construction. Unfortunately, full use of these opportunities is not being made in all cases, as is evidenced in particular by the fact that neither the Azneft' Association nor the Kaspmorneft' Association is meeting the assignments to expedite operational drilling.

Grave concern is caused by the already chronic lag of the Kyursanginskiy UBR, since the development of oil and gas extraction from a number of promising deposits in the Kura /Prikurinskiy/ Depression heavily depends upon its successful performance. To be sure the drilling rates are greatly retarded in this case by serious shortcomings in the technical-material supply of the brigades, but nevertheless the main reasons for the lag are the low standard of labor organization and poor preventive servicing of the equipment. Nor is it any coincidence that chiefly for these reasons the losses of productive time in the UBR amounted to nearly half the total time in the half-year.

A similar situation exists in a number of other drilling enterprises of Azneft' and Kaspmorneft'. The problem of activating oil wells is still critical. Often a well is dug ahead of schedule but its activation is delayed for months. Consequently the acceleration achieved by the selfless labor of a drilling brigade is nullified by an unskilled approach to testing the wells. The Siazan' UBR, the Dzharlinskiy URB, the Bukhta Il'yicha URB and several others are spending two and sometimes three times as much time on activating wells as it would take with skillful organization of the testing operations.

Extensive use of scientific-technical advances, of progressive methods of labor organization, and of innovating experience as well as the ability to work every day and every hour with maximum productivity are the basic factors for the success of every drilling collective.

In this connection it is impossible to overlook the organization of socialist competition among the drilling brigades of the Peschaninskiy MUBR, whose main indices of labor rivalry are introduction of new equipment and methods, strict observance of the drilling system dictated by the geologic and technical conditions, and use of productive time. And another important fact is that now in totaling the results of the brigades' competition they also consider the state of the environment and check whether hature has been harmed in the course of drilling the wells.

In active response to the party's appeal for further development of socialist competition, the drillers are daily intensifying the search for new opportunities to enhance labor productivity. In the Sangachaly MUBR six out of seven drilling brigades have already kept their pledge to fulfill the plan for 3 years of the five-year plan by the anniversary of the new Constitution of the USSR.

It is the duty of the party, trade union and Komsomol organizations and of the enterprise directors to make the leading workers' experience the property of all collectives. All reserves and potentials must be used for successful fulfillment of the annual plan for drilling and activating oil wells and the consequent enhancement of oil and gas extraction in the republic.

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PROBLEMS IN PETROLEUM PIPE QUALITY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Jul 78 p 1

[Article by N. Chmelev, chairman, plant committee of people's control, Taganrog Metallurgy Plant' A. Korkin, senior foreman, Office of Technical Control, Pipe-Rolling Shop No 1; and A. Golovenko, crew leader, pipe dressing section (Taganrog): "The Contribution Will Be Substantial. Taganrog Metallurgists Respond to Tyumen' Petroleum Workers"]

[Text] We are gratified by the successes of the petroleum workers of Western Siberia, whose efforts in the remote taiga have created the country's main fuel and energy base in a short time. The broad labor assault of the Tyumen' workers has also forced us to get going. This is especially true of the shops turning out petroleum pipe.

The first pipe rolling shop, built in the 1930's, has undergone remodeling. In the course of this work, much of the pipe making equipment has been replaced with new, including unique, equipment. This has made it possible to arrange the production of high-strength pipe made of ordinary carbon steel and to master the output of casing pipe with new types of threaded joints. The restructuring has helped to resolve two tasks at the same time: to renovate the products list and to almost triple the total production of casing pipe.

Much work has also been done in shop No 2, producing drill pipe. For the first time in this country, this shop has started operation of a thermal section where heating is accomplished by means of high-frequency currents. The shop has mastered the production of drill pipes with stabilizing bands and trapezoidal threading. Tertiary control over product quality has been organized by means of defectoscopes.

Along with measures of a technical nature, the plant is focusing substantial attention on organizational measures. Plant and shop quality meetings are held every week, and problems of complying with technology are examined every day in the shops. A complex system of quality control is being introduced, and 13 enterprise standards have been drawn up and are in effect.

As we can see, substantial work is being done. But the question naturally arises: what have the results been?

A commission looking in on the plant in May of this year checked up on a batch of casing and drill pipe. No deviations from standards and technical specifications were detected. But this by no means indicates that all is well with regard to petroleum pipe quality at the plant.

In the first quarter, substandard production amounted to 5.45 percent. This is less than last year, but nevertheless too high. The amount of casing pipe fittings that has to be scrapped is especially high. During the quarter, plant controllers judged more than 11,000 items to be substandard. And, as we know, a substantial quantity of pipe and fittings has to be scrapped by the petroleum workers.

In short, reserves for improving product quality are still considerable. The Tyumen' petroleum workers are right in calling on us to show greater responsibility for this problem and to toughen control in each shop, at each workplace. We discussed the letter from the Tyumen' people at meetings in shops, in shifts, and in crews; we examined the question at meetings of the party bureaus and the plant's part committee. What are the pipe makers doing about it?

It was judged essential, in the shortest possible time, to eliminate existing shortcomings in the keeping of normative-technical documentation and the maintenance of measurement instruments and the organization of the metrological service. Special attention is being focused on accelerating the operational startup of new pipe making equipment, improving the quality of the smelts in the open hearth shop, and straightening up the marking of pipes and their storage prior to shipping.

We must admit that, like pipe makers in other plants, we are quite disturbed by the low quality of the equipment for the manufacture of fittings. We are experiencing great difficulties because we have to operate obsolete equipment in cutting the pipe, also because of the shortage of metal protection rings. We believe that these are the problems which ought to be more vigorously tackled by the plant and by Soyuztrubstal' [All-Union Industrial Association for the Production of Steel and Iron Pipes].

Now let's discuss the partnership question. About 40 percent of all of the casing pipe produced by the plant is delivered to enterprises of Glavtyumenneftegaz [Main Tyumen' Petroleum and Gas Administration]. The total is more than 70,000 tons per year. Naturally, we are highly interested in knowing how our pipes behave in operation. Unfortunately, we have received no information at all from the Tyumen' petroleum workers, either last year or this. Yet such information would help to find more successful solutions to the problem of improving product quality. We think that for the sake of the matter we should have regular exchange of information.

For our part, we metallurgists have decided to send our own representatives to the petroleum fields of Western Siberia every quarter. This past spring we had the chance to visit the base of production-technical maintenance and supply of equipment in complete sets in Nizhnevartovsk. The trip was beneficial in many ways. But we must say frankly that we were not all that pleased. Thus, pipe from different plants is frequently subjected to pressure testing, and then substandard pipes that are detected are ascribed to one of the plants. The instruments and equipment used to check the pipes are not kept in good working order. Sometimes you can see that the pipe walls are of different thickness just by looking at them.

It goes without saying that Siberia's petroleum workers are laboring under difficult conditions. Yet there can be no justification for the kinds of things we witnessed. Stacks and packets of pipe are levelled by bulldozer and transported by portage. After that, how can there be any question of thread quality?

Our collective will continue its efforts to increase the production of petroleum pipe and to improve the quality. And we hope that the Siberians, in their turn, will treat our product more carefully.

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TURKMENNEFT' ON OIL WORKERS DAY

Ashkhabad TURKMENSKAYA ISKRA in Russian 3 Sep 78 p 2

/Article by P. Polyubay, Order of Lenin chief engineer, Turkmenneft' Production Association: "On Duty at the Oil Fields"/

/Text/ Western Turkmenistan is the area of a highly developed oil and gas extraction industry. Such big oil deposits as Kum-Dag, Koturdepe and Barsa-Gel'mes have been opened up here, and new ones like Gogran'dag, Chekishlyar, Erdekli, and others were added to them during the Ninth Five-Year Plan.

Discovery of the oil and gas and gas condensate deposits permitted rapid development of gas extraction. It is sufficient to say that gas extraction has almost doubled since the construction and activation of the Central Asia-Center gas pipeline was completed.

Not only the volume of oil and gas extraction has changed, but also the very methods of working the deposits and raising the oil from the wells. Whereas the oil used to be extracted by means of the natural energy of the stratum, today the progressive method of raising the stratal pressure by injecting water into the productive layers is being extensively applied. This method is being used at the Koturdepe and Barsa-Gel'mes oil fields in close collaboration with scientists from the TurkmenNIPIneft' /Turkmen Scientific Research and Planning Institute for the Petroleum Industry/. Treatment with water injected into the productive layers with surface-active agents, use of waste waters from petroleum processing for injection, superheating the drilling areas of oil wells with powder charges, etc. are all very effective and enable the Turkmen oil workers to considerably intensify their processing of the productive layers.

In connection with the reduced natural energy of the strata and the flooding of the oil, the oil extraction process itself has radically changed. The oil workers have begun to use the most economic method, namely a gas lift. Today about half the total volume of oil is extracted this way.

The complicated production processes require a reliable control over them, so that effective use of the instruments and measuring devices is being heavily emphasized. Work is being completed on application of radioisotopic level

regulators to the gas separators of low-temperature gas separation installations. Construction-installation operations are in progress for the automation and long-distance mechanization of group measuring equipment in western Barsa-Gel'mes, as well as starting and adjusting operations on the automated group measuring equipment in southeastern Koturdepe. Electronic computing equipment is firmly established.

In a word, the Turkmen oil workers are taking the course of technical progress, without which today's day of the industry would be unthinkable. Our innovators are making a great creative contribution to the improvement of equipment and technology. They have suggested hundreds of technical measures with great economic effect. The association's best innovators are M. Gel'dyyev, A. Gadzhinazarov from the Leninneft' NGDU /expansion unknown/, V. Bednyy, M. Dzhafarov from the TurkmenNIPIneft', and S. Annamuradov from Kumdagneft'. They have a great many valuable technical suggestions to their credit.

A great flow of oil is coming out of West Turkmenistan, supplied by thousands of workers, engineers, technicians and office workers. In dust storms and under the blazing sun of the desert they build drilling rigs, drill oil wells, lay pipelines and construct production bases. Many are shock workers. Last year the collective of the drilling brigade of Foreman A. Amanyazov from the Kuydzhikskiy UBR /Administration of Drilling Operations/ was awarded the title of "Best Drilling Brigade of the Ministry of the Petroleum Industry," and this year the names of A. Amanyazov and Capital Repairs Foreman K. Mollaniyazov from the Nebitdagneft' NGDU were entered on the Roll of Honor of the VDNKh /Exhibition of Achievements of the National Economy/ USSR. O. Garayev, foreman of underground repairs of the Kumdagneft' NGDU, was decorated with the Silver Medal of the All-Union Exhibition. Hundreds of the association's workers were awarded "Winner of Socialist Competition" badges.

The oil workers' competition is gaining ground. The Leninneft' and Chelekenneft' administrations made the best progress in the 7 months. The collective of the young Kamyshldzhaneft' NGDU also exceeded its plan task. The collective of the Nebitdagneft' NGDU is making every effort to enhance the effectiveness of oil extraction by actively combatting inundation, raising stratal pressures, and intensifying introduction of the gas lift.

Great and difficult tasks lie ahead. One of the main ones is to increase the raw material base. This task can be performed first of all by developing deep exploratory drilling. Prospecting of the Balkhan /Pribalkhanskiy/ region must be completed, and the early Mesozoic deposits must be penetrated. The Gogran'-dag-Okarem region has also been little studied so far.

But in speaking of augmenting the raw material base by developing new oil and gas reserves, we must not overlook better working of the existing deposits. The extent to which these reserves are extracted depends entirely upon the oil workers. The TurkmenNIPIneft' scientists and the association's whole geologic service have the first say in this matter.

Today I should like to congratulate all the gas and oil workers on their professional holiday and wish them every success in fulfilling their assignments.

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TURKMENGAZPROM ON GAS WORKERS DAY

Ashkhabad TURKMENSKAYA ISKRA in Russian 3 Sep 78 p 2

/Article by V. Talday, director of Turkmengazprom All-Union Industrial Association: "Gas Workers Shock Duty"/

/Text/ The nation's gas industry is a relatively young branch of the national economy, not much more than 20 years old, yet it has succeeded in becoming a strong fuel and energy base. Turkmenistan occupies an important place in output volume of natural gas.

As we know, gas extraction in the republic started in 1966. The preceding period was characterized by a swift development of the industry. While in its first year it extracted 1,265,000,000 cubic meters of natural and by-product oil gas, in 1977 the nation obtained over 67 billion cubic meters, including 59.4 billion cubic meters from the Turkmengazprom Association.

As much gas has been extracted in the 2½ years of the 10th Five-Year Plan from the Karakumy deposits as in the entire Ninth Five-Year Plan, and extraction of gas condensate has been more than doubled.

The workers of Turkmenistan's gas industry have reached their professional holiday with good results. By 27 June they logged fulfillment of their socialist pledges for the third year of the five-year plan, having obtained 1 billion cubic meters of gas above the plan. In 8 months the nation received an additional 1.4 billion cubic meters of gas. Extraction is up about 1 billion cubic meters from the same period of last year. The new Kirpichli deposit was activated this year, and five new natural gas deposits (Uch-Adzhi, Stikhiynoye, Vostochnyy Tedzhen, Malay and Shorkel') were discovered.

A great deal has been done to expedite technical progress. In particular, an EC-1022 electronic computer has been placed in operation in Ashkhabad to process data on exploitation of the deposits.

The gas workers competition is gaining ground. The gas extraction workers are taking every opportunity to enhance the effectiveness of production and the quality of their work. At the suggestion of V. Linichenko, drilling foreman of

the South Turkmen Exploratory Drilling Administration, 27 brigades of the association pledged to fulfill the plan for 3 years of the five-year plan by 7 October, USSR Constitution Day, and 11 of them have already reported fulfillment of their socialist pledges. Among these are the brigades of the drilling foremen V. Linichenko, V. Tsogoyev, V. Sirotkin, A. Yenikeyev, A. Khazhgeriyev, A. Uzdenov et al.

Hero of Socialist Labor P. Shcheblykin's drilling brigade fulfilled the plan for 3 years of the five-year plan and recently logged fulfillment of the 1978 plan, having drilled 300 meters in excess of the assignment.

The collective of the Shatlykgazdobycha Production Association also carried out its socialist pledge early and fulfilled the 3-year gas extraction plan.

The collectives of the Achakgazdobycha, Shatlykgazdobycha and Turkmentransgazavtomatika production associations, the tamponage office of the Naip Operational and Production Service, and the brigades for underground and capital repair of wells of foremen Reyimov and Manatsyuk were declared winners in the socialist competition. The Turkmengazprom Association's title "Best Worker in the Trade" was awarded to 17 gas workers.

The workers of Turkmenistan's gas industry are continuing to work with great enthusiasm. They have to bring the Kirpichli deposit up to planned capacity more rapidly and organize and activate the Beurdeshik, Severnyy Balkui, Mollaker and Vostochnyy Tedzhen deposits as well as the sulfur beds in the Gururtli deposit. Preparations must be made to activate the newly discovered Uch-Adzhi, Malay, and Shorkel' deposits, purifying installations must be constructed at the Naip, Gururtli and other deposits, the operation of the installations for preparing gas under the prescribed technological conditions must be stabilized, and introduction of the automated control system must be continued.

A second strand of the Shatlyk-Ashkhabad-Bezmein gas pipeline is to be built to increase the reliability of the gas supply of Ashkhabad and Bezmein cities and of a number of settlements. To deliver gas to the oblast center of Chardzhou, preparation of the capacities to receive it should be expedited, and construction of the gas pipeline to Deynau should be continued.

It is planned to construct a gas pipeline for the Turkmen Nitrogenous Fertilizers Plant under construction in Maryyskiy Rayon. Much must be done to improve the performance of the drilling and motor transport enterprises as well as the use of producer goods.

We can be sure that the gas workers of Turkmenistan will cope with their assignments and mark the third year of the five-year plan with new progress in the development of the republic's gas industry.

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FUELS AND RELATED EQUIPMENT

USE OF GAS IN HOUSEHOLDS INCREASES IN KAZAKHSTAN

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 3 Sep 78 p 1

[Article by Yu. Gudkov, chief of Kazglavgaz [Main Administration for Gas Service under the Kazakh SSR Council of Ministers]: "The Blue Fuel"]

[Text] The current holiday coincides with a vocational anniversary: 20 years have elapsed since our republic started to convert to the use of gas. In 1958 gas was brought into Alma-Ata for the first time, in cylinders. The advantages of the new fuel manifested themselves very quickly, and the requirement arose for an expansion in the use of gas, which would be delivered on an industrial basis. The Kazakh SSR Council of Ministers organized the Main Administration for Gas Service for this purpose. It was charged with multiple-purpose tasks. The main administration was to engage in the design, construction and operation of the appropriate facilities.

The desirability of creating the new organization was confirmed in the very first years. The pace of fuel sales, conversion to gas, and construction rose rapidly. Subunits of the main administration rapidly became highly profitable. The system's service was expanded and became stronger. Based on trusts and separate enterprises, 19 production associations have been formed in the republic, in all oblasts, and a special design institute is in operation.

While 10 years ago 149,000 tons of liquefied gas and 2 billion cubic meters of natural gas were sold, last year these indices increased respectively to 317,000 tons and 4.8 billion cubic meters. The profit obtained from the service's activity is completely adequate to cover the expenses connected with the creation of the new facilities, budget settlements, and upkeep of the administrative staff. Now we have converted to the new system of planning and economic incentives. The policy of expanding the supplying of gas is advantageous for the state and for the populace.

Nowadays 83 cities and towns, 114 urban-type settlements and 2,870 rural communities have gas service. The total number of apartments supplied with the blue fuel has reached 2,715,000. Moreover, gas is used by 72,000 shepherd families. Eighty-three percent of Kazakhstan's housing inventory is supplied with this fuel.

The pace of growth is constantly expanding. During the past 7 months of this year alone the number of apartments furnished with gas increased by 44,000 in cities and settlements and by 24,000 in the countryside. The plan to extend the service to the population was met 104.4 percent.

Stalwart collectives of the Petropavlovskoblgaz production association and the city's Almaatagorgaz production administration made a major contribution to the overall success. Dozens of competition leaders are purposefully fulfilling the high commitments they adopted in honor of the anniversary of the USSR Constitution. I would like to name a few names. These are V. Mikhaylichenko, mechanic for gas transportation of the Almaataoblgaz Association, Kh. Kamalov, mechanic of the Promgaz service of the Almaatagorgaz Association, G. Aytbekov, gas and electric welder of SMU-8 [Construction and Installing Administration No 8] of Kazgazstroymontazh [Trust for the Construction and Installation of Gas-Service Facilities of the Kazakh SSR], and A. Danilov, mechanic installer of SMU-3 of the same trust.

The rapid pace of development of the conversion to gas service in the republic suggests good prospects. Even now concrete and broad plans are contemplated. The capacity of all gas-distributing stations will have to be increased from 177,000 to 400,000 tons of fuel per year in the near future. For this purpose, it is planned to erect new centers and rebuild appropriate centers in Semipalatinsk, Ural'sk and other cities. Operating bases for gas service will be created, and the exchange of cylinders will be established for all oblast centers and interrayon gas-service centers.

In order to operate the gas service more effectively, Kazglavgaz's scientific-research and design institute will be reorganized. The natural blue fuel will come to the cities of Ural'sk and Gur'yev and many rayon centers.

Kazakhstan's gas-service workers, inspired by the decisions of the historic 25th CPSU Congress, are doing all that is necessary to convert the party's plans into action successfully.

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FUELS AND RELATED EQUIPMENT

URENGOY GAS FIELDS NOT GETTING NEEDED SUPPLIES THIS SUMMER

Moscow SOVETSKAYA ROSSIYA in Russian 23 Aug 78 p 1

[Article by V. Sil'chenko, carpenter and concrete worker of Urengoygazpromstroy [Trust for the Construction of Gas-Industry Facilities at Urengoy]; P. Rybin, chief of the construction project's Komsomol staff; B. Spel'nikov, brigade leader of Construction and Installing Administration No 57; Yu. Zhuravlev, deputy of the Urengoy Village Soviet; and R. Khvorostyanova, gas-recovery operator (Novyy Urengoy Settlement, Tyumenskaya Oblast): "Threatened with Failure"]

> [Text] What prevents the timely delivery of materials to the shockwork construction project.
>
> The newspaper has established an operating press center in the gas-recovery workers' northernmost village. Today we publish its first report.

As is known, gas of the unique Orengoy field has already been working for the country's economy for several months. Billions of cubic meters of the "blue fuel" have entered power and chemical systems since the startup day of the first sub-Arctic installation for the integrated treatment of gas. The plan for the All-Union construction project called for the introduction of two more installations this year. A hospital, school, housing and many other facilities that are necessary for those who labor in the difficult North will be constructed. It was planned to erect these ahead of schedule. However, the schedule for the construction project has been threatened with failure. Here are some of the facts.

Powerful Ural and ZIL [Moscow Motor-Vehicle Plant imeni A. I. Likhachev] vehicles and trucks and tractor trucks of other types often are idle these days because of a lack of fuel. Only about 5,000 tons of fuel and lubricants have been brought in by waterway since the start of the navigation season. But these have already been consumed, and the vehicle inventory is refueled "by water." The storage tanks for 60,000 cubic meters for the winter remain empty. It is scarcely necessary to explain what this means. River workers could deliver fuel and lubricants to us but

there are none in Glavneftesnab [Main Administration for the Transport and Supply of Petroleum and Petroleum Product] storage facilities.

Other cargo is received with great delays from the Pur River and from Nadym. The river workers are guilty here. Barges arrive extremely irregularly. Managers of the Irtysh Steamship Line explain the situation by a shortage of barges. However, experience indicates that at the end of the navigation season the required number of barges nevertheless exists. The captains themselves admit that it is more convenient for them to carry out the plan on the southern runs. And tow strings are sent to us only late in the fall.

This causes great expense. The year before last, for example, 35 barges were locked in the ice on northern rivers, and last year twice that many. Much cargo went to the bottom.

This is the schedule that the rivermen have also planned for the current navigation season. And some cargo they do not haul at all. Timber that has been logged with such great difficulty in the Tazy region was not included in the haulage plan. Yet the timber is extremely necessary to the gas producers' settlement for housing and social and cultural construction.

Cargoes are held back and a long time passes before they get to the river docks. Many enterprises fail to ship them. More than one and a half thousand tons of metal have not been shipped to Urengoy builders these days. Novokuznetsk, Zhdanov, Nizhniy Tagil and Komsomol'sk-na-Amur metallurgists explain this by the lack of the required amount of rail transport. But that is not the only factor. Often cargo is sent to where it is not needed. Kievspetskomplektgaz, Gor'kiyspetskomplektgaz and Podol'skspetskomplektgaz enterprises send freight cars to Sergino instead of to Labytnang. In so doing, they refer to the fact that the Labytnang railroad sidings are overloaded. But in fact cargo-hauling from Sergino to Urengoy is delayed for long months, until the winter roads appear.

Only a portion of the problems that must be solved as quickly as possible have been named. The fact is that the southern ports had already stopped loading barges headed for Urengoy at the end of August. In other words, all the cargo intended for the shockwork construction project should arrive at our place not later than the first 10 days of September. Otherwise, we cannot perform on time the work that is required to put new installations into operation and prepare soundly for wintertime work.

In his speech to the 18th Komsomol Congress Leonid Il'ich Brezhnev emphasized that the whole country must help the construction projects of the Tyumen' North. In response to this appeal, the Shockwork Detachment imeni 18th S"yezda VLKSM have come to the severe sub-Arctic. The young men and women who are working with us are striving to carry out as quickly as possible the party's instructions, to put the richest underground storehouses of Urengoy into the country's service. However, their enthusiasm and

labor impulse often is not backed up by the way the construction project is supplied with the necessary materials.

Nevertheless, despite many complexities, we carried out the plan for the first 7 months. We are hoping that, with the help of the metallurgists, who outfit the enterprises, and of transport workers, this success will be multiplied, and the country's energy reserves will be greatly augmented.

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FUELS AND RELATED EQUIPMENT

RECENT PROGRESS OF UKRAINIAN COAL MINING RECOUNTED

Kiev POD ZNAMENEM LENINIZMA in Russian No 14, Jul 78 pp 49-51

[Article by V. Voronin, First Deputy Minister of Coal Industry of the Ukrainian SSR: "Picking up the Pace"]

[Text] The country's miners, like the whole Soviet people, are toiling with inspiration in the third year of the Tenth Five-Year Plan to accomplish the majestic tasks on further developing the national economy that were contemplated by the 25th CPSU Congress. The coal industry is picking up the pace of its development, for it is the basis of the country's fuel and power complex.

Our republic's coal industry, which produces one-third of all the coal mined in the country and about half of the especially valuable coking coal, is making a great contribution to the execution of the program for further developing the industry.

The Communist Party and the Soviet Government are paying constant attention to developing the coal industry and are showing tireless concern for the miners—people of a heroic profession. This is testified to convincingly by the decrees of the CPSU Central Committee and the USSR Council of Ministers, "Measures for Developing the Donets Basin Coal Industry During 1976-1980," and "Additional Privileges for Workers of the Coal and Shale Industry and Underground-Mine Construction."

These documents defined a concrete program for the construction, reconstruction and reequipping with machinery of underground mines, preparation plants and coal-machinery manufacturing plants; and called for a broad program of social, cultural, sanitary and preventive-medicine measures, particularly the conversion of underground mines to the 30-hour workweek, the world's shortest, and increases in basic wage rates and in amounts of awards for years of service and of old-age pensions.

The decree, "Measures for Developing the Donets Basin Coal Industry During 1976-1980," called for bringing coal mined in the republic up to 226-229 million tons in 1980, 198-200 million tons of it in the Donbass [Donets Coal Basin], through the introduction of 7 new mines and the

rebuilding of 12 existing mines with a total capacity of 23.1 million tons of coal, and the turnover for operation of new and rebuilt preparation plants with a capacity for processing 24.9 million tons of coal per year. New underground mines will be introduced: the Dolzhanskaya-Kapital'naya with a capacity of 4.2 million tons of coal per year, the Zhdanovskaya-Kapital'naya—3.6 million tons, the Velikomostovskaya No 10—2.4 million tons, the Chervonogradskaya TsOF [Central Preparation Plant] with a capacity of 9.6 million tons, and others.

Attaching great importance to providing safe working conditions and protecting the environment, the state has allocated 347 million rubles for these purposes during the Tenth Five-Year Plan, versus 200 million during the Ninth.

Carrying out the ideas of the 25th CPSU Congress and the plans of the Tenth Five-Year Plan, the collectives of associations, mines and construction projects are doing much work to increase production capacity, speed up technical progress, increase the effectiveness and quality of operations and intensify production operations.

In 1976-1977 the production capacity of the underground-mine inventory rose by 6.75 million tons through the execution of organizational and technical measures, enabling the amount of coal mined during the anniversary year to increase by 4.2 million tons over 1975.

The construction of the mines Zhdanov-Kapital'naya and Zapadno-Donbasskaya No 6/42 is being carried on at a rapid pace that surpasses the standard period by a year.

Work has practically been completed now on mechanization of the most labor-intensive processes—loading the coal onto the conveyor at the breakage faces, and the loading of coal and rock during preparatory excavation. We mine 89 percent of all coal from gently-sloping seams with highly productive narrow-cut cutter-loaders and single-bucket overhead excavators, 52 percent of which are complexes that include mechanized supports. The level of conveyorized transport at the excavating sections has been brought up to 97 percent, and up to 78 percent on sloping excavations that transport coal.

It should be noted that much work has been done and is being done to improve and raise the level of mechanization at longwalls with steep inclines and of transport underground and on the mine surface and the mechanization of loading and auxiliary operations. Complicated electronic and isotopic equipment, hydraulics, and electronic computers and automatic control systems have come to the aid of the miners.

Technical progress is changing radically the content and nature of the miners' work. The miners' heavy physical labor is increasingly being done away with, while the level of mental labor of repairmen, adjusters, assemblers and those who control the machines' operation is being raised. The

conversion to narrow-cut excavation of coal is to be basically completed, and the level of mining of coal at longwalls that are supplied with equipment complexes is to be brought up to 63.4 percent, including 35 percent at seams with a slope angle of more than 35 degrees, during the Tenth Five-Year Plan.

Because of this, coal machinery manufacturing plants face important tasks: the production of KMK-98 and KM-98 mechanized complexes, SO-75, SN-75 and KTSCh single-bucket overhead excavators, K-103 cutter-loaders for gently sloping seams, and KG and KMD-72 equipment complexes for steeply sloping seams must be mastered.

Unfortunately, machinery manufacturing plants do not always satisfy the miners' requirements completely. Scientific organizations are to do much work in the area of accident prevention and industrial sanitation. The main efforts of scientists and designers have been aimed at effecting an integrated program in the drive against sudden outbursts of coal, rock and gas and the improvement and creation of more effective equipment for reducing the temperature in the working space of deep underground mines.

Much experience has been gained in the republic's coal-mining regions in the organization of socialist competition and the study, generalization and dissemination of advanced work methods of production innovators. As always, Donbass miners, whose selfless labor has obtained the high evaluation of the party and the government, are in the vanguard of the labor rivalry. More than 4,600 coal-industry workers of the Ukraine were awarded orders and medals for work results for the first 2 years of the five-year plan, and machinery operator Ye. P. Zav'yalov (of the Mine imeni Il'ich), faceman P. Ye. Lisnyak (of the Mine imeni Artem) and tunneler N. I. Stetsenko (of the Mine imeni K. Marks) were awarded the title Hero of Socialist Labor; and section chief Ivan Ivanovich Strel'chenko of the Trudovskaya Mine was awarded a second Hero's Gold Medal.

Eighteen coal industry enterprises of our republic were awarded challenge Red Banners of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee for All-Union socialist competition results during the current five-year plan. These include collectives of the Krasnodonugol' Association, the Mine Administration imeni 60-Letiya Velikoy Oktyabr'skaya Sotsialisticheskoy Revolyutsii of the Shakhterskantratsit Association, the Ternovskaya Underground Mine of the Pavlogradugol' Administration, Velikomostovskaya Mine No 7 of the Ukrzapadugol' Association, and others.

Fifteen enterprise and association collectives were entered on the republic's Honor Plaque of the VDNKh [Exhibition of Achievements of the People's Economy] of the Ukrainian SSR for high labor achievement in 1977.

In response to the Letter of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee, "The Promotion of Socialist Competition for Fulfillment and Overfulfillment of the

1978 Plan and Intensification of the Drive to Raise Production Effectiveness and Work Quality," the republic's coal industry workers have undertaken a labor drive to fulfill the tasks of the current year of the Tenth Five-Year Plan ahead of time.

The collectives of 18 brigades that have undertaken commitments to mine 500,000 tons of coal from a single mine face during the third year of the five-year plan and 126 brigades that are mining at least 1,000 tons of coal each per day are in the vanguard of the competition. Among them are the brigades of Hero of Socialist Labor V. G. Murzenko (of the Krasnyy Partizan Mine), A. D. Polishchuk (of the Trudovskaya Mine), N. N. Skripnik (of the Mine imeni Frunze), N. I. Lukashev (of the Krasnoluchskaya Mine), V. I. Ignat'yev (of the Krasnolimanskaya Mine) and many others that have stepped far beyond the 1,000-ton goal and are systematically fulfilling socialist commitments.

Having supported the initiative of advanced Moscow collectives to fulfill the plan for the first 3 years of the five-year plan by 7 November 1978, the collectives of 42 mines, 280 mine sections, 388 mining and 133 tunneling brigades and 3,941 faceworkers are laboring on fulfillment of the increased commitments. By 15 June, 1,123 faceworkers had coped with their tasks ahead of time.

The tunnelers are working in shockwork fashion. The brigades under V. G. Vendilovich (of the Mine imeni Abakumov of the Donetskugol' Production Association), D. G. Khomich (of the Chervon Zirka Mine of the Torezantrasit Production Association) and I. M. Khvorostyn (of the Svetlopol'skaya Mine of the Aleksandriyaugol' Production Association) have achieved especially high penetration rates this year.

Ukrainian SSR Minugleprom [Ministry of Coal Industry] production associations and enterprises are working constantly on dissemination of the initiative, "Not One Lagging Element," the originators of which were Heroes of Socialist Labor A. Ya. Kolesnikov and V. I. Pikhterev. The essence of this initiative is that the brigades conclude contracts about creative collaboration and mutual assistance that foresee questions of the assimilation of new equipment, the organization of technical training, successive on-the-job training for workers in competing brigades, and the transfer of advanced production experience directly to workplaces.

This year alone 325 advanced underground mining brigades have undertaken patronage assistance to laggards. And here is the result—132 brigades overcame the lag and overfulfilled the plan task for the first 5 months of this year.

In 1976-1977 mineface workers of the brigade led by Hero of Socialist Labor V. N. Pikhterev extended patronage assistance to the collective of Section No 3 of the Mine imeni Chelyuskinets of the Donetskugol' Association. The advanced collective helped the colleagues in competition to overcome their lengthy lag more rapidly and to master a 1,000-ton workload

at the longwall. This year the miners of the third section, in their turn, undertook patronage over the lagging section No 11.

The collectives of sections 84/860 and 83/860 of the Mine imeni V. I. Lenin of the Artemugol' Production Association are collaborating successfully. The section that received patronage assistance (83/860) carried out the plan for mining coal for the first 5 months of 1978 by 115.5 percent and reduced the ash content of the coal mined by 0.2 percent below the plan.

At the Dneprovskaya Mine of the Pavlogradugol' Association, G. N. Skopin's brigade of mineface workers twice transferred to lagging longwalls and came out among the advanced brigades. There is not one lagging coal-mining brigade at the mine at present.

Brigades of mineface workers of mines of the Krasnodonugol' Association of Hero of Socialist Labor A. Ya. Kolesnikov (of the Molodogvardeyskaya Mine), Hero of Socialist Labor N. G. Ivashchenko (of the Mine imeni Lyutikov) and M. P. Vasil'yev (of the Talovskaya Mine) decided to overfulfill shift norms for excavation per ton this year through better use of mining equipment and improvement of organization of the industrial process. The initiators of increased labor productivity were supported by 1,354 mining brigades. During the first 5 months of this year 760 brigades and 3,483 mineface workers overfulfilled tasks for mining coal. For Ukrainian SSR Minugleprom as a whole, the shift norm for excavation was raised by 0.09 ton.

Since the start of the five-year plan, the republic's miners have yielded 9.7 million tons of coal above the established plan. At the same time, the scientific and technical revolution and growth of the country's productive forces have made new and increased demands on power engineering and, above all, on the fuel industry. Therefore, the Ukrainian SSR coal industry established this year an additional task for the mining of 6.2 million tons of coal. However, the industry has not been coping with this task recently because of the fact that at certain underground mines the level of mining called for has not been reached, production capacity is being assimilated poorly, a lag in the development of the mine as a unit has been permitted, the potential of new mining equipment is not being fully utilized, and brigades have been undermanned with workers.

The reequipping of various mines with machinery is being conducted at a slow pace, and reduction in the time taken to erect coal enterprises has been slow. There are deficiencies also in generalizing and disseminating the work experience of advanced collectives.

Mines and construction projects operate rhythmically and collectives carry out plans and socialist commitments with confidence where enterprise managers, engineers and technicians deeply and creatively approach the compilation of the program for conducting mining operations, consider the long term, skillfully organize the work of excavating and tunneling brigades, and widely use the achievements of scientific and technical progress.

Guided by the decisions of the December 1977 Plenum of the CPSU Central Committee and by the comments and suggestions expressed by CPSU Central Committee General Secretary and Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev during his trip to areas of Siberia and the Far East, in his speech to the 18th Komsomol Congress and in the books "Malaya Zemlya" [Small Land] and "Vozrozhdeniye" [Restoration], the associations and enterprises have developed and are successfully executing measures aimed at further improvement of the style and methods of organizational and political work, the elimination of deficiencies in the industry's operations, growth in production effectiveness, improvement in quality of the coal mined, and a rise in the efficiency of socialist competition. In so doing, we are paying special attention to growth in labor productivity, an increase in the workload at the mineface, the conducting of excavation work, and a reduction in the time taken to introduce coal industry facilities into operation.

Underground miners and underground-mine builders and all workers of the republic's coal industry are applying all their efforts, knowledge and experience in order to carry out the plan and socialist commitments for 1978 and the Tenth Five-Year Plan as a whole.

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KUZNETSK COAL TO SUPPLY SOLID FUEL TO THE CENTER

Moscow PRAVDA in Russian 25 Aug 78 p 2

[Article by Dr of Economic Sciences V. Popov, director of the Laboratory of Economic Forecasting of the USSR Academy of Sciences Siberian Department Institute of Economics, and A. Bogachuk (Kemerovo): "The Kuznetsk Variant"]

[Text] In the third year of the five-year plan, the Kuznetsk Basin is for the first time producing 150 million tons of fuel. Over a 10-year period, coal production there has increased by 1.5 times. But the basin's potential is by no means exhausted. Economists and geologists believe that Kuzbass is capable of producing additional hundreds of millions of tons per year. Moreover, almost half can be sent to the European part of the USSR, and Siberian reserves can be used to make up for the shortage in the country's thickly populated regions. In terms of scale, the resolution of this task can be compared with the discovery of a second Donbass.

Geological coal reserves in the Kuzbass today are estimated in the hundreds of billions of tons, and 240 billion tons are most accessible for industrial development. Thus, even assuming a one-half billion annual production these reserves will last for five centuries. Then add to these the hundreds of billions of tons concentrated nearby in the Kansk-Achinsk Basin. Obviously, Siberia's coal, like Siberia's petroleum and gas, is to play an enormous role in the country's future fuel and energy balance.

Until recently, the Kuzbass was viewed primarily as a source of coking coal for ferrous metallurgy. This idea came to be more insistently emphasized with the beginning of development of the KATEK [Kansk-Achinsk Fuel-Energy Complex]. It was said that the Kuznetsk grades of power coal "could not compete" with the Kansk-Achinsk.

Indeed, KATEK brown coal is cheaper than Kuznetsk coal. If we consider the generation of electricity, part of which is to be transmitted to the center, the importance of the Kansk-Achinsk Basin is difficult to exaggerate. But

the center is also requiring more and more solid fuel. For this reason, we must be concerned for an all-round, integrated solution to fuel and energy problems.

Of course, the Kuzbass will continue in the foreseeable future as a main supplier of coking coal. Of the hundreds of millions of tons of planned production, about one-third will go for metallurgical coke. The remainder consists of high-calorie power coal that is suitable for transport over any distance and, in terms of caloricity, is almost twice as good as brown coal. In short, it is a matter of burning the KATEK coal, which is difficult to transport, in the thermal power plants (including in the Kuzbass) to supply the development of energy-intensive operations there, and supplying the European territories with scarce Kuznetsk coal. Such recommendations on the development of Siberia's fuel power engineering were made a year ago at a scientific-practical conference held in Kemerevo by the Institute of Economics and Organization of Industrial Production of the Siberian department of the USSR Academy of Sciences, with the participation of representatives of USSR Gosplan and other central organizations.

How to cope with the problem of shipping tens of millions of tons of Siberian coal to the center? The Trans-Siberian Railroad, even if a third track were to be laid, is not up to the task. Obviously, it will be necessary to build a specialized coal-carrying line from the Kuzbass through the Southern Urals to the regions along the Volga. It is also technically feasible to build large pipelines to transport crushed coal in a water medium.

All of this, including the organization of the delivery of fuel over great distances, will require substantial capital outlays. Nevertheless, the proposed variant is economically advantageous. The fact is that even considering the cost of shipping, Kuznetsk coal will be cheaper than that mined in the Donbass, and overall the implementation of the Kuznetsk variant promises a national economy effect amounting to two to three billion rubles.

The calculations are these: it now costs 1.7 times less to produce one ton of coal in the Kuzbass than in the Donbass, and the cost is 40 percent lower than the sector average. According to mining experts, by the end of the present century the prime cost of fuel there can be reduced by at least 1.5 times thanks to open pit mining methods. The volume of pit mining in the Kuzbass can be increased by four to five times, bringing it up to the level of 200 to 210 million tons per year.

In the last 20 years, the hydraulic technology of exploiting coal deposits has become entrenched in the basin and demonstrated its undisputable advantages. It is sufficient to note that labor productivity in underground operations within Gidrougol' [Hydraulic Coal Mining Association] is twice as high as the basin average, and within the Yubileynaya hydraulic mine it is three times as high, while the prime cost of one ton does not exceed outlays in open pit operations.

VNIIgidrougol' [All-Union Scientific-Research and Planning-Design Institute of Hydraulic Coal Mining] has worked out the technical-economic substantiations for the construction of a hydraulic mine with a projected productivity of 400 to 500 tons per worker per month; this is three times as high as the top level of productivity in mines using the traditional "dry" technology. Plans are being drawn up for a huge hydraulic mine with an unprecedented productivity--700 to 800 tons. The prime cost of the fuel in such an enterprise will be reduced by 1.5 to 2 times, and specific capital investments by 20 to 25 percent.

The USSR Ministry of Coal Industry has decided to convert a number of mines of Prokop'yevsk and Novokuznetsk to hydraulic operation. There is every reason to assume that in the next 10 to 15 years the volume of hydraulic mining will rise by five to six times.

It is the unanimous opinion of economists and geologists that the first step toward the creation of Big Kuzbass should be the development of the Yerunakovskoye field, whose reserves almost equal those of the Kuznetsk Basin. Plans call for building a number of large mining enterprises, such as the Il'inskaya Mine with an annual capacity of seven million tons and the Taldinskiy pit with a capacity of 13 million tons. Roads, power transmission lines, and other preparatory projects were supposed to be completed in the last five-year plan. But they have not been completed to this day--the level of financing set by the Ministry of Coal Industry does not provide, within the five-year period, for the development of even the construction base to start the building of mines and pits.

In this connection, it must be emphasized that in the last 10 years, despite a 1.5-fold increase in mining in the Kuzbass, not a single new mine or pit has been built. Also dragging on from year to year is the rebuilding of existing enterprises. One out of every two mines has been undergoing "renovation" over a 10 to 16 year period, and by the end of the rebuilding practically all of the coal reserves in the new horizon will have been depleted. Throughout the basin as a whole, a disproportion has developed between the rate of production and the increase in capacity of the mining enterprises. This year, for example, the planned level of production exceeds by nine million tons the total productive capacity of existing mines and pits. All of this is cause for profound concern.

Recently, it has become customary to blame all troubles on the builders. It is true that in the last seven years the mine builders have failed to provide the miners of the basin with new capacities amounting to 12 million tons. But the worst thing is that volumes of construction and rebuilding of mines and pits has been reduced, and housing construction for the miners has also declined. In all likelihood, the trouble began with the transfer of the mine building organizations from the USSR Ministry of Construction of Heavy Industry Enterprises to the USSR Ministry of Coal Industry system. Incidentally, construction of facilities for KATEK also lags behind planned schedules...

At the dawn of Soviet rule, V. I. Lenin predicted for the Kuzbass a major role in the development of ferrous metallurgy in the Urals and Siberia, and he proposed and argued for the idea of creating a Ural-Kuznetsk combine. History has confirmed the correctness of Lenin's prediction. Now, the Siberians are handling even more massive tasks. Siberian petroleum and gas are already serving the country. The day is not far off when the mines of the Kuzbass, "in harness" with KATEK, will take on a key role in the development of Siberia's power operations, in supplying coal to the Urals and the Center.

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CHARDARA--FERGANA PIPELINE NEARS COMPLETION

Ashkhabad TURKMENSKAYA ISKRA in Russian 3 Aug 78 p 4

[Article by O. Kirova: "Chardara--Fergana Petroleum Pipeline"]

[Text] Nebit Dag. With the project portion of TurkmenNIPIneft' [Turkmen State Scientific-Research and Planning Institute of the Petroleum Industry], work is completed on plans for the Chardara--Fergana Petroleum Pipeline, 575 km long.

The Fergana petroleum refinery supplies petroleum products to Central Asia. The crude oil is delivered there from Siberia by rail. The huge new pipeline will make it possible to convert to the cheaper and more rational method of transporting petroleum. It will take its start from the huge Pavlodar--Chimkent long-distance pipeline near Chardara Station.

The route of the pipeline is a rough one. It crosses mountains, ravines, and numerous irrigation systems in Kazakhstan, Uzbekistan, Tadzhikistan, and Kirgiziya. The project's chief engineer, R. Kh. Karachurin, reports that the designers have considered all of these factors. In order to make the construction less expensive and reduce the time required, all elements are designed for block component manufacture. Boilers, pumps, transfer pumping stations, and monitoring and communications systems will arrive at the site fully assembled from plants in the USSR, Czechoslovakia, Hungary, and the other CEMA member countries. All processes involved in transporting the crude are designed to be automated.

For the service personnel, plans call for the construction of comfortable settlements, recreation centers, dispensaries, and Pioneer camps.

On remote sections of the pipeline, aircraft will be used; for this reason, the plan calls for building helicopter pads.

TurkmenNIPIneft' personnel have accumulated considerable experience in designing large pipelines that are being built in different parts of our country. Their designs have invariably earned high praise from the client--the USSR Ministry of Petroleum Industry.

The new project--the pipeline from Chardara to Fergana--will be completed in September of this year.

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POSSIBLE USE OF POLYMERS TO EXTRACT KASAKH CRUDE

Moscow IZVESTIYA in Russian 18 Aug 78 p 2

[Article by M. Estrin: "Petroleum Extracted by Polymers"]

[Text] A new petroleum deposit has been discovered at Karazhanbas in the solonchak steppes of northwest Kazakhstan.

Conditions in this land are severe. Freezing winters, blazing summers--up to 40 degrees in the shade. Fresh water is to be found only in infrequent wells. The distance to the nearest population center--Fort Shevchenko--is almost 400 km.

Nevertheless, these difficulties are not the main hindrance to access to the underground riches of Karazhanbas. The main obstacle is the exceptionally high viscosity of the crude. It is more than 40 times "thicker" than Tyumen' petroleum. If ordinary extraction methods were to be used at Karazhanbas, a great deal of the valuable crude would remain in the ground.

The problem is being worked on by major scientific collectives, including Termneft' All-Union Association in Krasnodar, the Moscow Institute of Geology and Development of Mineral Fuels, the USSR Academy of Sciences Institute of Problems of Mechanics, and the All-Union Petroleum and Gas Scientific-Research Institute. It is a difficult problem.

One interesting proposal on extracting especially viscous petroleum is to use an aqueous solution of the polymer polyacrylamide to dissolve it. An industrial experiment has been set up on a small experimental section. The results are encouraging.

On another experimental section, tests are underway on the already familiar method of thermal stimulation of crude in the ground to reduce its viscosity. Operational verification will answer the question as to which way is most promising at Karazhanbas.

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BAKU CHRISTMAS TREES, OTHER EQUIPMENT FOR SIBERIA

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Jul 78 p 1

[Article by S. Vidgof (Baku): "To Fill Siberian Orders"]

> [Text] There is a huge map of the country between the aisles in the Christmas tree machine assembly shop of the Baku machine building plant imeni Leytenant Shmidt. On it, red lines connect Baku to various points in the Soviet Union. The line is especially red on the Baku--Siberia section: almost 60 percent of the product turned out by the plant is sent to the country's main petroleum base.

Christmas trees to equip the mouths of petroleum and gas wells, drilling equipment, and well repair equipment made by the Baku machine builders are at work in Tyumen', Nizhnevartovsk, Surgut and Nefteyugansk, Labytnangi, and Orenburg.

The assembler crew headed by Nabi Binatov came up with the slogan, vigorously taken over throughout the enterprise, "Excellent Equipment for the Siberians in the Shortest Possible Time."

The section of the initiators of competition consists of two stands side by side, where they assemble the basic Christmas tree components. The assemblers work fast and harmoniously. Individual bits and pieces become openwork structures before your very eyes.

"The openwork structure is deceiving," smiles the crew leader, "the Christmas tree must withstand a formation pressure of about 350 atm, and twice as much under plant testing conditions. This is probably comparable to the pressure of powder gases in a gunbarrel. So that the toughness and hermetic sealing of the fittings constitute a main condition of high quality."

The assemblers are honorably meeting this condition: everything assembled by the collective bears the honored five-sided figure.

But how do you step up the pace? The supply of components to the finishing section is planned precisely in the shop. This is the concern of the shop chief N. Almadatov. Much also depends on the machine tool operators working in the next section. Boring and turning lathe crews headed by B. Mustafayev and A. Akperov, having adopted higher obligations, are striving to supply the assemblers with sufficient stocks of components. And they, in turn, intensifying the work day to the maximum, utilizing rational assembly methods, are overfulfilling norms daily.

The pace set by their colleagues has made it possible for shop economists to make the following prediction: if the pace is maintained, 350 sets of Christmas trees will be produced over and above the year's program for the Siberians.

Next to the machine assembly shop is the plant's fitting and assembly department. Tractors come out of its doors with their characteristic road and, turning around, stand in a row. Almost all of the equipment for capital well repair is mounted on them. Fourteen-meter rigs are loaded onto platforms. These are mini-shops, known to the petroleum workers by the name Bakinets. Behind the row of Bakinet's are powerful machines--rod carriers which are inferior in size only to the KORO-80 units recently put into production at the plant.

"Equipment does not stay idle here long," says the plant's party organization secretary M. Israfilov. "We have drawn up a special schedule for delivering equipment to Western Siberia. The Baku railroad workers, whom we asked to help in shipping the equipment on time, responded in deed: extra rail cars are always placed at the plant's disposal. Shipments are sent off without delay."

Labor collaboration between the transport workers and the machine builders has made it possible to ship the petroleum workers, geologists, and gas workers of Siberia more than 1,000 units of equipment since the beginning of the year. A batch of Christmas trees and facility equipment was shipped ahead of schedule to Northern Tyumenskaya Oblast, to the Orenburg and Shatlyk fields.

"We are in constant contact with our clients," says the plant's deputy director N. Gorbatov. "This 'feedback' helps to improve our equipment and find new solutions."

High quality, reliability, and durability--these are the main guidelines of the Baku machine builders. It helps them achieve excellent results: the plant has received practically no complaints, and 6 out of 10 products sent to the eastern regions of the country bear the Emblem of Quality. The enterprise collective has decided to complete all Siberian orders before 7 November.

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PROLONGING LIFETIME OF OFFSHORE TRESTLES IN CASPIAN

Baku VYSHKA in Russian 1 Aug 78 p 2

/Article by G. Avetisov, chief engineer, Kaspmorremstroy Trust, Kaspmorneft' Association: "Durability of Offshore Trestles Enhanced"/

/Text/ The Kaspmorremstroy Specialized Platform Trust was formed 3 years ago on the basis of the Office for Anticorrosive Protection of Offshore Oil Field Equipment, but it was converted in April 1978 to a trust with four separate subdivisions to handle the increased workload of repairing offshore trestles.

The trust's collective is confronted with two main tasks, namely protection of the offshore equipment from corrosion and capital repair of the trestles that have become useless. This article tells how the trust's collective operates and what unsolved problems are facing it.

Big hydraulic structures were installed in the early 1950's when oil extraction was developed in various areas of the Caspian (at first at Artema Island, Neftyanyye Kamni, and Peschanyy Island and later off Cape Sangachaly too), and their protection from corrosion became a daily concern of the oil workers.

Every year the offshore oil fields were extended and the trestles were lengthened, and this naturally required perfected methods of combatting corrosion of the metal. This was done by the workers in close and creative cooperation with specialists from the Gipromorneft' Institute, who also developed the whole procedure for protecting the oil field installations from damage.

As we know, the supports of the equipment, or rather the areas of periodic wetting, are the most vulnerable part of the metal structures. We are now making extensive use of a special enamel, recommended by scientists, that has good protective properties and is also effective for coating spans, pipelines and cisterns. Experience has shown that enamel coatings retard rusting of the metal by 2 or 3 times.

Use of magnesium protectors has produced quite good results. They used to be suspended on cables and lowered into the sea, but now they are welded to the supports of the future "steel islands" that are assembled directly in the plant

that makes the foundations. This has greatly enhanced the effectiveness of the process.

Galvanized thermal diffusion pipes have come into extensive use in the construction of trestles and stationary platforms. They double the length of service of the supports and accordingly permit savings of 25 million rubles in building a trestle 50 km long.

The rust is removed from the surface of the metal structure before the protective coat of paint is applied. A sandblast is used for this purpose, and it is the most laborious part of our whole operation. Moreover shipping the quartz sand from Volgograd that is suitable for cleaning the metal is very expensive.

We are now on the way to solving the problem of facilitating this laborious operation. The laboratories of the Gipromorneft' Institute have developed special transforming fluids which, when applied to the rust, convert it to a protective ground coat to which the paint can be applied. It is planned to perform industrial tests of this very valuable process this August and we hope they will prove successful.

The length of service of the trestles and oil field capacities heavily depends upon the quality of the repairmen's work, so that our trust devotes daily attention to this problem. Our laboratory closely checks the quality of repairs throughout the whole technical process, from the preparation of the varnishes and paints on the base to the last brush stroke, as they say, on a metal structure. Defects are recorded in a special log, correlated and then analyzed at the monthly conference of section heads, superintendents and foremen.

The shop policy of rewarding the workers who have achieved results of the best quality also helps to enhance the reliability of the repair work.

The plan and the socialist pledges for 1978 are being successfully fulfilled by the trust's collective: The assignment for the first half was fulfilled 102.7 percent. Labor productivity was up 3.6 percent during this period. The brigades of Yadulla Aliyev, Anatoliy Yashchenko, Sergey Arzumanyan, Azizagi Mamedov, Vladimir Borodin, Ashraf Kuliyev et al. fulfiiled their norms 130-150 percent.

The anticorrosion measures taken by the trust in the Artemneft' NGDU /expansion unknown/ imeni Serebrovskiy, imeni 22nd Party Congress, imeni 50th Anniversary of the USSR and imeni N. Narimanov permit annual savings of 1 million rubles or 5,000-6,000 tons of metal.

But we still have a great deal to do. Take for example the old trestles built before 1967, which are nearly 150 kilometers long. For some reason the earlier plans did not provide for installation of safe approaches or facilities for anticorrosion operations under a trestle. To be sure we have found a solution, but the rope ladders, ladders, cradles and other inadequate devices the repairmen are using cause a great deal of trouble and impair their labor productivity.

It is true that the Gidromorneft' specialists developed metal pontoon-platforms several years ago. But they proved inconvenient in operation, and furthermore

they soon rusted and became useless. We wanted them to continue working on this. In particular, we think it would be a good idea to make the hulls of the pontoons out of plastic reinforced with glass fiber.

We do not find the pneumatic method of painting satisfactory either. The engineering and technical workers of our trust jointly with the Gipromorneft' specialists are looking for an economical method of mechanical painting. We think this will not be so difficult because our country has already had experience in organizing such a painting process. It is also important for the plans drafted by the institute for the anticorrosive protection of metal to include measures to protect the environment.

The trust has restored 25 km of trestles in 3 years, but the collective is not entirely satisfied with this work. The trouble is that the piles are damaged in the area of periodic wetting, which amounts to 10-12 meters, and since they lack the necessary equipment the repairmen cannot replace the damaged part alone and have to discard the whole pile.

It has now been decided to procure semiautomatic equipment for underwater welding, to train personnel, and to adopt a new working method that will solve the problem of rapid repair of the trestles at minimum cost. The trust also intends to procure a pneumatic punch, an original device developed by the Novosibirsk scientists for driving piles. Used instead of a heavy derrick with a mechanical drop weight, it will considerably expedite repair operations.

Our young trust is gaining strength. Since the day it was organized the volume of its construction-installation operations has increased by almost 4 million rubles, and we are to assume greater tasks in the future. The trust's workers are making every effort to prolong the lifetime of the offshore hydraulic equipment and to maintain the constant rate of the offshore oil conveyor.

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ESTONIAN SHALE-BURNING POWER PLANTS

Moscow PRAVDA in Russian 31 Jul 78 p 2

[Article by V. Krotov, USSR Minister of Power Machine Building; P. Neporozhniy USSR Minister of Power and Electrification; and Academician M. Styrikovich, secretary, USSR Academy of Sciences Department of Physical-Technical Problems of Power Engineering: "With the Energy of Fuel Stone"]

[Text] Lenin's program for the country's electrification was based on the principle of making maximum use of cheap local types of fuel in the overall energy balance. This premise is viable today. The northwest European part of the USSR, with its developed industry and agriculture, is poor in industrial deposits of coal, petroleum, and gas. The only local source of organic fuel in the region is shale.

The shallow depth at which this fuel stone occurs makes it possible to mine it not only by the shaft but also the open pit method with relatively low outlays. Despite the low caloricity of shale, the construction of power plants in regions of shale mining, with minimum outlays on delivering the fuel, promises substantial national economy effect. To this day, specialists abroad have avoided the industrial utilization of this fuel because of the extremely large technical difficulties involved in burning it in power boiler facilities. And in the mid-1950's, we ourselves had little experience. But the demands of our developing national economy have dictated the necessity of making extensive use of Baltic shale deposits in the country's energy balance.

The first experience of using shale, in Kokhtla-Yarve and Akhtme, demonstrated the necessity of a broad complex of scientific-research and planning-design work to study the properties of the new energy fuel and its combustion products. It was necessary to determine the principles of designing boiler equipment capable of reliably and economically operating on shale fuel. It was necessary to determine the optimal operating regimes of equipment, components, and systems most adaptable to a fuel so difficult to use in power engineering.

The difficulties involved in the use of shale derive from its high content of mineral ballast and, to an even larger extent, the specific physical-chemical properties of the individual components. The formation of dense ash deposits that are difficult to remove from the heating surfaces of the boiler units and the intensive corrosion of the metal subjected to smoke-stack gases constitute only part of the problem.

The Baltic GRES went into operation in the 1960's, and the Estonian GRES went into operation in the 1970's. When these huge power plants went into operation, requiring more than 10 million tons of fuel per year, new problems arose: how to unload and prepare the fuel for burning as effectively and cheaply as possible, how to remove colossal amounts of ash and slag, how to protect the environment. They were successfully resolved through the creative efforts of many collectives of power machine builders, planning and scientific-research institutes, construction workers, installers, and operations workers. They succeeded in developing equipment capable of reliably and economically burning ordinary shale in huge boiler facilities.

A successful solution was found to the problem of recovering production wastes. Shale ash is used widely to lime the acid soils of the nonchernozem zone of the country, and it is used to produce building materials and high-quality cement.

Thus, for the first time in world experience two power plants with a total capacity of more than three million kilowatts are in operation. The Estonian GRES is one of the key enterprises in the sector, in terms of its production and generation of electricity it has surpassed projected indicators. A task of national importance has been solved--an abundant local fuel has been put to the service of the national economy, making it possible to burn shale to generate already more than 170 billion kilowatt-hours and to release 70 million tons of standard fuel for the national economy. This experience can be utilized in developing the abundant Kansk-Achinsk brown coal deposits.

We consider it entirely fitting to nominate for the USSR State Prize the work of the authors' collective "Construction and Operation in the Estonian SSR of the World's First Large-Capacity Power Plants Running on Local Shale Fuel."

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